SR-12 Comprehensive Corridor Evaluation and Corridor Management Plan, from SR-29 to I-5

Final Existing Conditions Technical (ECT) Report

Prepared by:

PBS&J, an Atkins Company

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Existing Conditions Technical (ECT) Report

Executive Summary

Purpose of Study

State Route 12 (SR-12) passes through four counties (Napa, Solano, Sacramento, and San Joaquin); three California Department of Transportation (Caltrans) Districts (4, 3, and 10); developed areas including Suisun City, Fairfield, and Rio Vista; rural communities, farmlands, and portions of the Delta. The 53-mile, multi-jurisdictional corridor also passes through three Metropolitan Planning Organizations (MPOs): the Metropolitan Transportation Commission (MTC), the Sacramento Area Council of Governments (SACOG), and the San Joaquin Council of Governments (SJCOG). The corridor also lies within the jurisdiction of the Napa County Transportation and Planning Agency (NCTPA) and the Solano Transportation Authority (STA). As such, the corridor impacts the daily lives of many interested stakeholders.

SR-12 supports interregional, recreational, commuter, agricultural, and military traffic between the Bay Area and the San Joaquin Valley. SR-12 is important for recreational travelers destined for Napa, Solano, and Sonoma Counties, as well as the Delta. It also serves as a commute corridor and a key interregional goods movement corridor because of its direct access to I-80, I-5, and Travis Air Force Base.

The purpose of this study is to conduct a coordinated, comprehensive evaluation of the SR-12 Corridor and to develop a multi-jurisdictional corridor management plan that includes stakeholder input and consensus on a set of prioritized improvements for SR-12. The study will develop a multi-jurisdictional corridor management plan that includes stakeholder input and consensus on a set of near- and long-term improvement strategies for SR-12. This study and the resulting corridor management plan will build upon existing studies prepared for the corridor and incorporate the most recent transportation forecasts based upon current land use plans for each of the counties located along the corridor.

The study will identify improvement strategies that could include, but are not limited to, roadway widening, median treatments, intersection improvements, safety enhancements, pedestrian facilities, bicycle facilities, transit improvements, Intelligent Transportation System (ITS) deployments, and bridge improvements. Identified improvement strategies will be compared and contrasted based on engineering analyses, cost estimates, and other factors to arrive at a recommended corridor improvement strategy. Once adopted, this strategy will be used by the various transportation agencies to inform future county and regional funding and planning processes to implement improvement strategies.

Stakeholder Participation in the Study

Extensive stakeholder coordination is an essential element of the study to gain input, reviews and concurrence at key milestones of this study. There are four stakeholder groups assembled to serve in distinct roles to assure that all elements of the study receive interjurisdictional and public scrutiny. These stakeholder groups are:

- Project Development Team (PDT): comprised of professional staff from Caltrans Districts, MPOs, Counties, and the study consultant team, meeting monthly to direct and guide the study, and responsible for review of all work plans and products;
- Technical Advisory Group (TAG): comprised of executives from transportation agencies, city engineers, safety officers and highway patrol, transit agencies, ports, and regulatory agencies, meeting periodically at major study milestones to provide input and guidance;
- Corridor Stakeholders: organized groups with a special interest in the corridor, such as air quality officials, civic and environmental groups, downtown associations, private developers, and pedestrian and bicycle advocates, who are briefed by the PDT at major study milestones and asked to provide input; and
- Public: all citizens interested in the corridor, who are invited to attend open-house forums to review major study work products, ask questions, and provide input.

Existing Conditions Technical Report

The first element of work for the study is to document existing conditions along the corridor. The following technical Report presents a summary of the existing conditions analysis as of December 2010 prepared for the SR-12 Corridor in Napa, Solano, Sacramento and San Joaquin counties from SR-29 to the I-5 Interchange. The primary objectives of the existing conditions analysis are 1) to present a clear and concise description of the SR-12 Corridor's existing transportation conditions, 2) to identify deficient geometric conditions, 3) to identify specific locations and causes of congestion along the corridor; and (4) to identify safety and operational issues along the corridor. Further, the Existing Conditions Technical Report establishes a "baseline" for the evaluation of future conditions.

The Existing Conditions Technical Report is presented in four sections:

- Section 1: Description of the SR-12 Corridor: A summary of the basic features of the corridor including information on previous studies and current projects; travel markets served; alternative modes of travel; existing geometric conditions; public, rail and marine transportation; intelligent transportation systems (ITS); geologic conditions; and climate and weather conditions, including areas of risk to potential sea level rise.
- Section 2: Geometric Evaluation of the SR-12 Corridor: An evaluation of the geometric conditions in the corridor, including identification of geometric deficiencies, issues with the existing physical conditions, and characterization of the three moveable bridges within the corridor.
- Section 3: Traffic Characteristics of the SR-12 Corridor: An evaluation of existing traffic data along the corridor with respect to seasonal, weekly and hourly variation. This evaluation establishes key analysis periods for the corridor and presents information on truck and heavy vehicle, recreational vehicle, and agricultural traffic in the corridor. Further, it examines frequency of bridge openings and impact on traffic congestion.
- Section 4: Performance Evaluation of the SR-12 Corridor: An evaluation of corridor performance based on vehicle delay and congestion. This section describes the methodology and measures used to identify existing congested areas; provides an evaluation of travel delay and speed; evaluates the impact of moveable bridge openings on traffic delay; and provides an assessment of accidents and incidents for the corridor.

Key Issues

Each of the sections of the Existing Conditions Technical Report conclude with a summary of key issues. These key issues, some based on new analysis and others summarized from previous studies, are as follows:

- *Baseline Conditions*: Substantial improvements have been implemented and further improvements are programmed in the SR-12 Corridor to enhance safety and improve geometry and traffic operations. The results of these recently completed and planned projects will correct many of the deficient existing conditions. The baseline conditions for this Study include recently completed and planned projects that will be constructed by 2014. These baseline conditions form the basis for analysis of future conditions and will be used to develop improvement strategies.
- *Public Transportation:* There is limited public transit service in the SR-12 Corridor. While serving important transportation needs in the corridor, public transit does not play a substantial role in the corridor trip making.
- *Proposed Marine Highway:* The M-580 Marine Highway Corridor plays a vital role in delivery of cargo through the corridor. The proposed marine highway extension to the Ports of West Sacramento, Oakland, and Stockton may reduce the number of trucks on the corridor.
- *Geology and Geotechnical Conditions:* Highly compressible soils throughout segments of the corridor may require specialized geotechnical engineering solutions to allow for roadway construction and other improvements that may be identified as part of the mitigation strategies for the corridor. These costs will need to be considered.
- *Levees and Flooding:* The extensive levee system that protects public and private infrastructure, including SR-12, from flooding is vulnerable to failure due to seismic activity, high-water, and even dry-weather risks. These levees have experienced failures in the past resulting in inundation along SR-12. The potential for levee failure and inundation is exacerbated by the climate change occurring now and is expected to increase along with the potential for sea level rise.
- *Fog:* While fog is fairly common along the SR-12 Corridor, especially through Sacramento and San Joaquin Counties and the Suisun Marsh area, it does not result in a significant number of accidents in the corridor.
- *Geometric Deficiencies:* Upon completion of the current and planned projects, there will still be several areas that have geometric deficiencies, including non-standard inside and outside shoulder widths for 22% of the corridor, including the Rio Vista and Mokelumne Bridges.
- *Bicycle Facilities:* Upon completion of the current and planned highway projects, a 2-mile segment will remain west of Rio Vista with inadequate shoulder width causing bicyclists to ride in travel lanes of SR-12.
- *Bridge Condition:* All three moveable bridges and four other fixed bridges in the corridor are considered either structurally deficient or functionally obsolete; the Rio Vista Bridge is both. Neither structural deficiency nor functional obsolescence necessarily indicates that a bridge is unsafe.
- *Vehicle Traffic:* 2010 Average Daily Traffic (ADT) volumes along the SR-12 Corridor range from approximately 42,000 in the vicinity of I-80 to 20,000 in the vicinity of I-5. SR-12 experiences lower ADTs (10,000 to 15,000) on segments east of Walters Road and west of Brannan Island Road. Traffic count data from May 2010 should be adjusted to account for lowered volumes due to economic recession when used for predicting future traffic volumes.
- *Truck Traffic:* Truck and heavy vehicle traffic makes up seven to fourteen percent of daily vehicle trips along the SR-12 Corridor.
- *Recreational Traffic:* The Delta region is a popular recreational destination and recreational vehicle traffic is estimated to be from two to eight percent of all daily vehicles. Recreational vehicle traffic was observed to be highest during weekends.

- *Agricultural Traffic:* Agricultural vehicle traffic is common both on the mainline and at crossings. Accommodations for agricultural vehicle crossings need to be considered in mitigation strategies.
- *Travel Times:* Travel time data indicates the presence of low average speeds on the west end of the corridor between I-80 and Walters Road through Suisun City. The presence of lower speeds is observed on segments that carry the highest corridor volumes between Abernathy Road and Walters Road. Slower speeds were also observed in the vicinity of Rio Vista and near the I-5 interchange, which can be attributed to the presence of traffic signals and closely spaced intersections. The remaining segments of the corridor operated close to posted speed limits with little to no congestion.
- *Intersection Delay:* The signalized intersections on the west end of the corridor (between Beck Avenue and Walters Road) experience the highest delays. These delay trends are reflected in slower travel times for these segments. A few of the unsignalized intersections function with higher delays for the side streets; however, operations on SR-12 remain unaffected at these locations. Similarly, segments on the west end of the corridor (between I-80 and Walters Road) experience the highest congestion due to the presence of signals. Segments operating under uninterrupted flow conditions in Sacramento and San Joaquin Counties operate with acceptable LOS (LOS C or better). Mainline operations in the vicinity of I-5 are similar to those near I-80.
- *Impact of Moveable Bridges:* Operations of the movable bridges (Rio Vista and Mokelumne) have significant impacts on the corridor travel time. The frequency of bridge openings ranges from one to two times daily during winter months, to as many as 24 times per day during peak summer months on the Mokelumne Bridge. Bridge openings add approximately 25 minutes of delay, which leads to travel times that are 50% longer than normal travel times. The bridge openings also induce queues in excess of 200 vehicles in the peak direction.
- *Safety:* The safety enhancement elements and multi-faceted safety enhancement strategy adopted in 2007 appear to be making a difference in the corridor. There has been a downward trend in accidents and a larger decline in the severity, particularly fatal accidents, between 2007 and 2008 after the full implementation of these initiatives. However, most of the corridor still has accident categories (Total, Fatal, Fatal+Injury) higher than the statewide averages for similar facilities.
- *Centerline Barrier Safety:* Review of accident data from the three years before and two years after installation of a temporary concrete barrier on the centerline of the section of SR-12 between Walters Road and Shiloh Road indicate a reduction in the number of injury accidents and elimination of fatalities due to vehicles crossing the centerline. However, the total number of accidents has not decreased and may be attributed to an increase in collisions with the barrier due to minimal inside shoulder width.
- *Bridge Approach Safety:* The approaches to moveable bridges experience higher accident rates than their adjacent segments.

Each of the above key issues will be evaluated during the development of the future conditions analysis to determine the impact of forecasted conditions and to identify improvement strategies to mitigate negative conditions.

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Appendices

List of Exhibits

Section 1: Description of the SR-12 Corridor

This section provides a description of the previous studies, safety enhancements, current projects and the corridor's physical characteristics including existing roadway, bicycle/pedestrian facilities, public transportation services, marine and rail facilities, as well as ITS infrastructure. Additionally, there is a discussion on the unique challenges of the Delta, including geologic conditions, the existing levee system, and the potential effects of climate change and sea level rise.

SR-12 passes through four counties (Napa, Solano, Sacramento, and San Joaquin); three Caltrans Districts (4, 3, and 10); developed areas including Suisun City, Fairfield, and Rio Vista; rural communities, farmlands, and portions of the Delta. The 53-mile, multi-jurisdictional corridor also passes through three Metropolitan Planning Organizations (MPOs): the Metropolitan Transportation Commission (MTC), the Sacramento Area Council of Governments (SACOG), and the San Joaquin Council of Governments (SJCOG). The corridor also lies within the jurisdiction of the Napa County Transportation and Planning Agency (NCTPA) and the Solano Transportation Authority (STA).

The economy of the study area has traditionally relied on agricultural production. San Joaquin County ranks seventh out of 58 counties in California in market value of agricultural products sold. The San Joaquin Valley, which includes San Joaquin County and seven other counties, produces 49% of California's agricultural products.[1] At the same time, the study area has been experiencing heavy urban development. The population of San Joaquin County has increased by 19.7% between 2000 and 2009 (from 563,603 persons to 674,860 persons). The population of Sacramento County has increased by 14.5% during the same period (from 1,223,497 persons to 1,400,949 persons). Population increases during the same period in Napa and Solano counties has been slower: Solano County has increased by 3.2% (from 394,545 persons to 407,234 persons) and Napa County has increased by 8.3% (from 124,279 persons to 134,650 persons).[2] Much of this growth has been a by-product of the high costs of living or conducting business in the San Francisco Bay Area. This trend is likely to continue and pose planning challenges to the area.

SR-12 supports interregional, recreational, commuter, agricultural, and military traffic between the Bay Area and the San Joaquin Valley. SR-12 is important for recreational travelers destined for Napa, Solano and Sonoma Counties, as well as the Delta. It also serves as a commute corridor and a key interregional goods movement corridor because of its direct access to I-80, I-5, and Travis Air Force Base.

The route crosses two major Interstate routes (I-80 and I-5), three State Routes (SR-113, SR-84, and SR-160), two railway lines (Union Pacific and Sacramento Northern), navigable water bodies with three moveable bridges (Sacramento River Crossing at Rio Vista Bridge, Mokelumne Bridge, and Potato Slough Bridge) and numerous at-grade and grade separated intersections. The overall route is 53 miles long from SR-29 to I-5 (42 miles from I-80 to I-5). The portion of the study between SR-29 and I-80 commonly referred to as the Jameson Canyon, will rely on existing analysis and documentation. Exhibit 1-1 shows the SR-12 Corridor Study Area.

1 United States Department of Agriculture, *2002 Census of Agriculture*, 2002.
2 U.S. Census Bureau. 2010.

Exhibit 1-1: SR-12 Corridor Study Area

Previous Studies, Safety Enhancements and Current Projects

This study builds on previous and on-going work to develop a comprehensive corridor evaluation and corridor management plan for the SR-12 Corridor. Many previous studies over the last decade have looked at various segments and locations along SR-12; these include a safety enhancement program implemented over the past three years in an effort to reduce accident occurrence and severity. Caltrans and the regional transportation agencies have been actively developing and delivering improvement projects including State Highway Operations and Protection Program (SHOPP) and State Transportation Improvement Program (STIP) projects within the SR-12 Corridor.

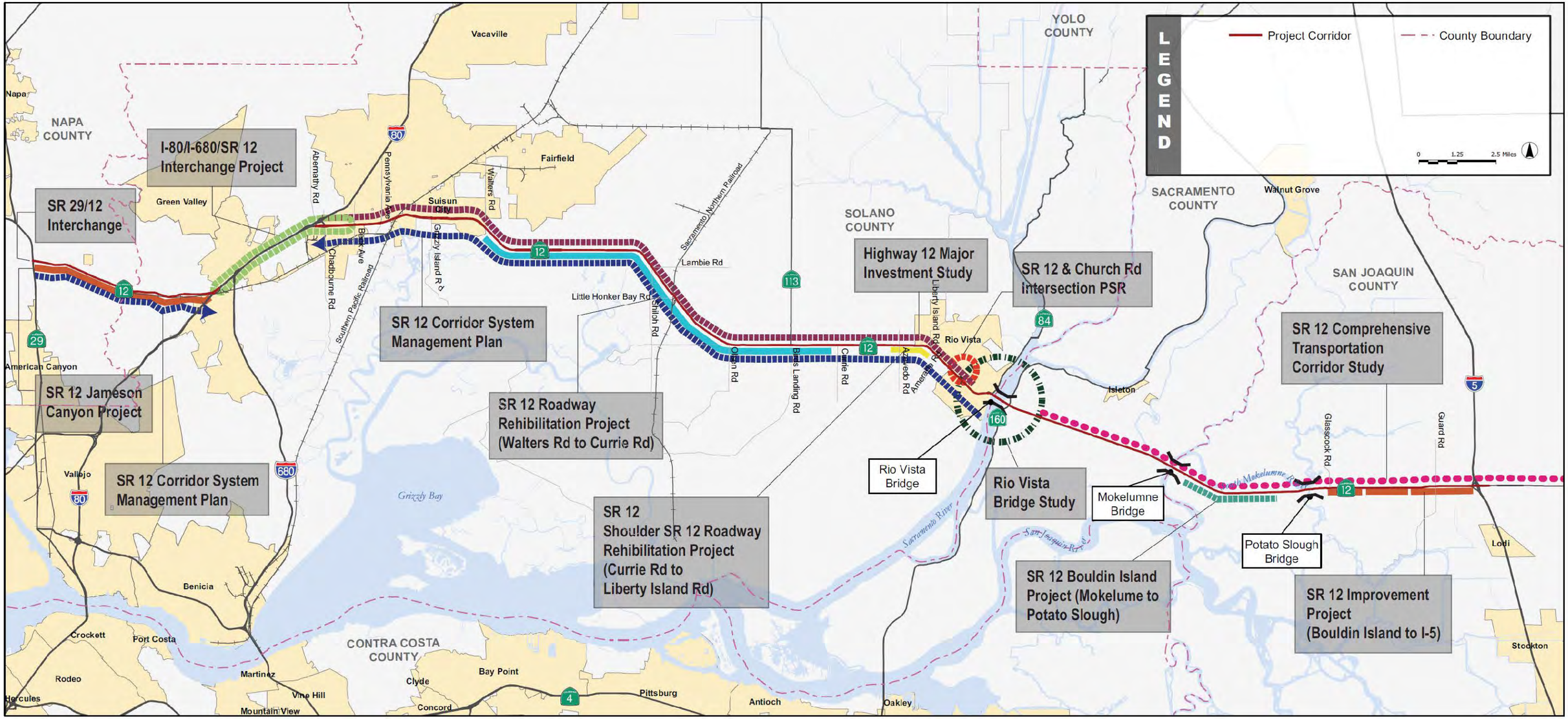
The following sections present summary information of these studies and projects. This includes a significant safety enhancement program that was implemented beginning in 2007 in an effort to reduce the number and the severity of accidents on SR-12. This program is discussed in detail below. It should be noted that in parallel with this study, Caltrans District 4 is developing a Corridor System Management Plan (CSMP) for SR-12 between SR-29 and the Rio Vista Bridge. This CSMP is a requirement of voter-approved Proposition 1B/Corridor Mobility Improvement Account (CMIA) funding for the SR-12 Jameson Canyon Project (Napa EA 04-264134, Solano EA 04-264144).

Previous Studies

In the past decade there have been numerous studies on segments of SR-12. The following studies have been completed within the SR-12 Corridor study limits. Locations and approximate limits of each study are shown on Exhibit 1-2.

Highway 12 Major Investment Study (2001) – This study analyzed SR-12 between I-80 and the Rio Vista Bridge. The study identified near-term (2010) and long-term (2025) improvement options for SR-12. Five build alternative packages were developed, which were (1) a transportation demand management package, (2) a safety improvement package, (3) a passing lane installation package, (4) a near-term traffic improvements package, and (5) a long-term traffic improvement package. The near-term traffic improvements package included intersection improvements and the long-term traffic improvement package included recommendations for four-lane sections, six-lane sections, and median barriers and shoulder widening in other areas.

Exhibit 1-2: Previous Studies and Current Projects on SR-12



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State Route 12 Comprehensive Transportation Corridor Study Rio Vista Bridge to SR-99 (2006) – This study analyzed. existing and future conditions on SR-12, between the Rio Vista Bridge and SR-99, and developed conceptual physical improvements and demand management practices to serve future (2030) conditions. The study developed four build alternative project groups, which included a transportation system management/demand management group, a three-lane operational enhancement group, a four- to six-lane capacity enhancements group, and a Rio Vista Bridge replacement group. The project groups included several elements within each group of projects. The four- and six-lane capacity enhancements included options for a completely new alignment of SR-12 in the Delta area between Rio Vista and I-5.

State Route 12 Transit Corridor Study (2006) – This study analyzed existing transit options and developed options for additional transit service along SR-12 in Napa and Solano County. This study provides viable alternatives through the development of a service plan that addresses current and future transit needs between Solano and Napa counties along SR-12. The study identifies a three phase implementation plan for transit service with a final route that provides bus transit between the City of Rio Vista and the City of Napa using SR-12.

Rio Vista Bridge Study (2010) – This study advanced a previous study of alternatives and developed new alternatives for a new SR-12 crossing of the Sacramento River in and around the City of Rio Vista. The Study developed five potential build alternatives, four bridge crossing alternatives and one bored tunnel alternative. Three alternatives included a completely realigned SR-12 around the City of Rio Vista. The bridge crossing alternatives included options for a mid-level moveable bridge and a high level fixed bridge.

SR-12 and Church Road Intersection Project Study Report (PSR) (2010) – This study developed improvement alternatives for the intersection of SR-12 and Church Road just west of the City of Rio Vista. Currently Church Road and Amerada Road are offset by a couple hundred feet as each tie into SR-12. Alternatives include realigning Church Road (to the north) and/or Amerada Road (to the south) to form a four leg intersection, and adding left turn pockets and a second through lane in each direction within a quarter mile of the intersection.

SR-12 Corridor System Management Plan (CSMP) (2011) – Caltrans District 4 is the lead agency, working in partnership with local agencies and groups to develop a CSMP for a 30-mile stretch of the SR-12 Corridor between the Jameson Canyon and the Solano/Sacramento County line.

SR-12 Transportation Concept Report (TCR) (Underway) – Caltrans District 10 is developing develop a TCR – a long range planning document that identifies how the corridor will be developed and managed over a 20-year period for the portion of SR-12 within District 10.

Related Studies

Several studies have been prepared and have been relied upon for elements of this Existing Conditions Technical Report, including:

Solano Countywide Bicycle Plan (2004) – This Plan, currently being updated by the Solano Transportation Authority, encourages the development of a unified bicycle system throughout Solano County. A goal of the Plan is to maintain a countywide bikeway network that integrates with a coordinated transportation system and connects bicycling with other modes of transportation, and increases the use of bicycles as a viable alternative to the automobile.

Sacramento River Deep Water Ship Channel Limited Reevaluation Study – This study is being conducted as part of the Congressionally-authorized project being implemented by the U.S. Army Corps of Engineers and the Port of Sacramento. They are preparing a joint Supplemental EIS to evaluate the action of resuming construction of navigational improvements to the

Sacramento River. The 46.5-mile long ship channel serves the marine terminal facilities at the Port of Sacramento and joins the existing 35-foot deep channel at New York Slough, providing access to the Port of Sacramento from San Francisco Bay area harbors and the Pacific Ocean.

Delta Risk Management Strategy (2009) – This study prepared by the California Department of Water Resources summarizes an evaluation of levee failure risks in the Delta and Suisun Marsh due to seismic events, flooding, climate change, and subsidence.

Vulnerability of Transportation Systems to Sea Level Rise, Preliminary Assessment (2009) – This report prepared by Caltrans assesses the vulnerability of the State's transportation system to sea level rise due to climate change.

Short-Term Safety Enhancements

Safety has long been an issue on SR-12 and several previous projects and studies have identified several sections of SR-12 with accident rates higher than the statewide average. In March 2007 alone there were six fatalities (in four accidents) on SR-12 within the study area. Improving safety has been a priority of Caltrans and local transportation agencies for some time, and the counties of Solano, Sacramento, and San Joaquin have been working collaboratively with Caltrans and the California Highway Patrol (CHP) to improve safety.

The Solano Transportation Authority (STA) has developed a multi-faceted strategy for the SR-12 Corridor and includes four key elements: legislation, enforcement, education, and engineering. As part of this strategy, SR-12 has been designated a Safety Corridor from I-80 to I-5. Implementation of many elements of the safety enhancement strategy began in mid-2007 and by early 2008, implementation of all elements of this strategy had begun. Specifics of each element include:

- Legislation – Assembly Bill 112 was introduced and passed in October 2007. AB 112 created a safety enhancement-double fine zone (DFZ) on SR-12 between I-80 and I-5, and defines criteria for similar roadways to qualify for DFZ. This was an important piece of legislation as it was fundamental to the success of many other elements of the SR-12 safety enhancements.
- Enforcement – The authority provided in AB 112 allows the CHP the ability to enforce double fines on traffic violations along SR-12. In addition to the ability to enforce DFZ citations, CHP has received increased grant funding over the last several years to expand their enforcement efforts. This includes an Office of Traffic Safety grant as well as additional CHP funding and assignment of officers to the Solano office of the CHP Golden Gate Division.
- Education – A public outreach and education campaign, focusing on educating the commuting public on improving safety on SR-12, was initiated in 2007 and continues today.. The campaign includes branding SR-12 as a Safety Corridor, providing updates on enforcement efforts and the status of current and upcoming construction projects. STA periodically produces a newsletter titled SR-12 Status, focusing on SR-12 issues.
- Engineering – In the summer of 2007, Caltrans implemented short term safety enhancement elements including re-striping a no-passing zone from Suisun City to Rio Vista, and adding several radar speed detection signs, temporary changeable message signs (CMS), and other warning and speed limit signs. Caltrans also installed temporary concrete barrier on the centerline between Walters Road and Shiloh/Lambie Road, channelizers on the centerline from Shiloh/Lambie to Drovin Drive in Solano County, centerline and shoulder rumble strips on SR-12 in Sacramento and San Joaquin counties to I-5 and Solano County from Currie Road to Drovin Drive, and re-striping no-passing zones in sections through San Joaquin County. These improvements were completed in the fall of 2007.

Current Projects

There is one project recently completed on SR-12 between Walters Road and Currie Road in Solano County and several other projects that are close to advertisement or in the project development process. These projects address many of the deficiencies and implement some of the improvement elements identified in previous studies. Details on each of these projects are provided below. The locations of these projects are shown in Exhibit 1-2.

SR-12 Roadway Rehabilitation Project (Solano EA 04-0T10U) – This recently-completed SHOPP project extends from Walters Road to Currie Road and includes rehabilitation, reconstructing and some realignment of SR-12. The roadway was rehabilitated between Walters Road and Shiloh/Lambie Road and the median concrete barrier remains with no additional shoulder widening. Between Shiloh/Lambie Road and Currie Road, the work includes rehabilitation, widening and full reconstruction. Full reconstruction includes sections of realignment to improve the horizontal and vertical alignments. The final configuration between Shiloh/Lambie Road and Currie road includes full width outside shoulders with rumble strips and centerline rumble strip with channelizers. Additional intersection improvements, including widening and left turn channelization, are included along with drainage improvements. This project was completed and opened for traffic in December 2010.

SR-12 Jameson Canyon (and SR-12/SR-29 Intersection) Project (Napa EA 04-264134, Solano EA 04-264144) – This project includes a major reconstruction and widening of SR-12 between SR-29 and Red Top Road to a four-lane conventional highway with a median concrete barrier and full width shoulders. The reconstruction will include horizontal and vertical alignment changes to meet a 55-mph design speed. This project will widen and improve at grade intersections at Kelly Road, Kirkland Ranch Road, and Lynch Road. Additionally, an intersection for u-turns will be provided in the middle section of the project. This project is expected to be advertised for construction in the spring of 2011 and be completed in 2013.

The connections to SR-29 and I-80 will not be improved in the first phase of construction. The SR-12/SR-29 intersection was studied and a preferred alternative was identified and cleared in the environmental document. This preferred alternative for SR-12/SR-29 includes reconstructing the existing at-grade intersection to a tight diamond interchange. The SR-12 (West) and I-80 interchange is being studied and developed as part of the I-80/I-680/SR-12 Interchange project discussed below.

SR-12 Bouldin Island Project (San Joaquin EA 10-0G800) – This SHOPP project includes rehabilitating and reconstructing 4.5 miles of SR-12 between the Mokelumne Bridge and Potato Slough Bridge to change from a two-lane conventional highway to a two-lane divided highway to improve traffic operations and safety. The scope of the project includes widening to full width outside shoulders with rumble strips, adding a concrete median barrier and providing six-foot inside shoulders for the most part adjacent to the concrete barrier. In order to complete the required widening, the entire roadway will be realigned to the south of the existing roadway. A substantial pavement structural section will be used in this difficult geological area so that the pavement design life will be longer than the existing roadway. This project is scheduled for advertisement for construction in the summer of 2012 and should be completed in 2014.

SR-12 Improvements Project (I-5 to Bouldin Island) (San Joaquin EA 10-0A8404) – This project has two primary purposes—a direct operational improvement by eliminating left turns at the Glascock Road intersection, along with installing left turn pockets and acceleration lanes at other major intersections between Little Potato Slough Bridge and SR-5; and to construct a "Smart" Corridor, by the installation of various Intelligent Transportation System (ITS) elements to provide travelers real time information on the status of SR-12 between SR-5 and SR-80. The project also includes expanding an existing park-and-ride lot. The physical limits of the project are from I-5 to the Potato Slough Bridge, but the ITS elements extend all the way to Rio Vista. Intersection improvements consist of realignments, left turn channelization, acceleration lanes, and bus turnouts at several locations including Tower Parkway, Glasscock Road, Correia Road, and North Guard Road. The ITS elements include various components, including traffic monitoring stations, changeable message signs, and extinguishable message boards. The intent of the ITS elements are to alert drivers of traffic conditions along SR-12 and these elements include signs along I-5 to alert drivers of SR-12

conditions. The construction of the intersection improvements and ITS elements is scheduled for advertisement for construction in the summer of 2011 and should be completed in 2013. Expanding the existing park-and-ride between the I-5 NB Off-Ramp and North Thornton Road has been included as part of this project, but it will be constructed at a future date, and not with the first phase of construction.

SR-12 Roadway Rehabilitation Project (West of Currie Road to Liberty Island Road) (Solano EA 04-2A6200) – This SHOPP project ties into the current SHOPP project near Currie Road and extends the rehabilitation and widening east to Liberty Island Road. The scope of the project includes rehabilitation of the pavement, widening of shoulders to full eight-foot outside width, and intersection widening and left turn channelization at Currie Road, McCloskey Road, and Azevedo Road. The project also includes improving three non-standard vertical curves to meet a 55-mph design speed. Centerline rumble strip with channelizers and rumble strips on the outside shoulders are included in the improvements. This project is currently in design and is scheduled to begin construction in 2012 and be completed in 2014.

I-80/I-680/SR-12 Interchange Project (Solano EA 04-0A5300) – This project, currently in the project approval/environmental document (PA/ED) phase, is analyzing and developing improvement alternatives for the interchange complex of I-80/I-680/SR-12 (east and west along I-80). Two build alternatives were presented in the Draft Environmental Document and both include work along SR-12. Both build alternatives include the reconstruction of the SR-12 (West) and I-80 interchange, but with different configurations. Work at the SR-12 (East) and I-80 interchange is different between the two alternatives and extends east to near Pennsylvania Avenue. One alternative proposes a single interchange on SR-12 to access Beck Avenue and Pennsylvania Avenue. The other alternative includes two interchanges to provide access to Beck Avenue and Pennsylvania Avenue and eliminates access to SR-12 from Jackson and Webster Streets. This project is still in the PA/ED phase with final design anticipated to start in 2011.

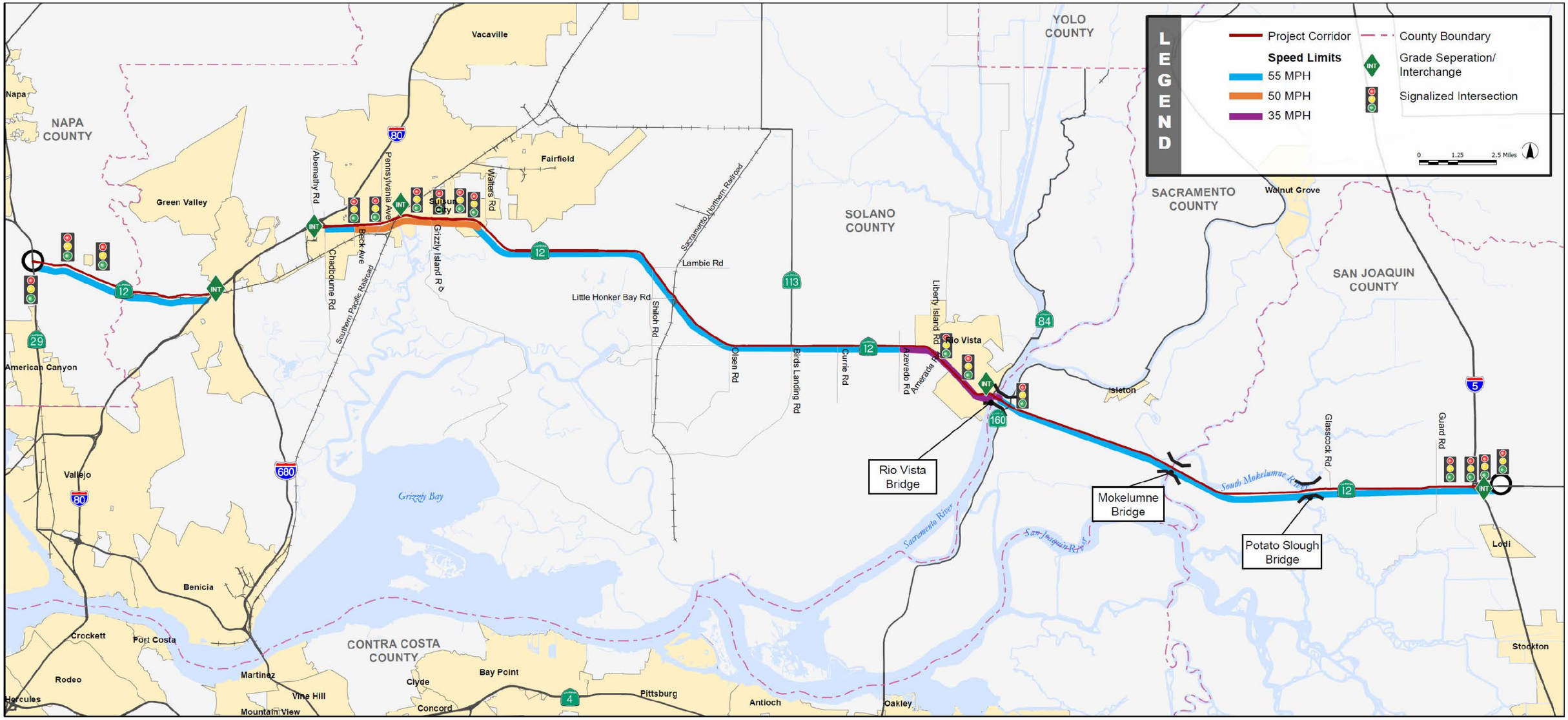
Characteristics of the SR-12 Corridor

SR-12 supports interregional, recreational, commuter, agricultural, and military traffic between the Bay Area and the San Joaquin Valley. In addition to providing east-west access between I-5 and I-80, SR-12 is a major east-west highway serving the San Joaquin Valley communities and the communities in Solano and Napa Counties. SR-12 is important for recreational travelers destined to and from Napa, Solano, and Sonoma Counties as well as to and from the Delta. It also serves as a commute corridor and a significant interregional goods movement corridor because of its direct access to I-80, I-5, and Travis Air Force Base. SR-12 crosses three waterways with moveable bridges which take precedence in operation over SR-12 traffic.

There are various highway classifications along the 53-mile stretch of SR-12 within the project limits. There are freeway, expressway, and conventional highway segments on SR-12. With two- and four-lane urban and rural sections, the speed limit and amount of traffic on SR-12 varies significantly across the corridor. Traffic varies from as low as 9,300 to a high of 41,700 average vehicles per day and average truck traffic on SR-12 varies between 7% and 14%, or 950 and 3750 trucks. The speed limits on SR-12 vary from 35 mph in the City of Rio Vista to 55 mph in the rural segments. Exhibit 1-3 shows the speed limits for the corridor and locations of signalized intersections. The section in rural Solano County between Rio Vista and Suisun City is now posted at 55 mph following completion of the SR-12 Roadway Rehabilitation Project.

As can be seen in Exhibit 1-3, there are limited alternative routes to SR-12. With the exception of the Solano Urban area, there are no arterial roadways or local streets that provide an alternative parallel route. Due to the lack of parallel facilities, SR-12 is the primary east-west travel way between northern San Joaquin County communities such as Lodi, and Solano County communities such as Fairfield and Suisun City. SR-12 is also the only east-west commuting option for the City of Rio Vista. The lack of competitive alternative routes demonstrates the importance of SR-12 and how prolonged traffic congestion or emergency incidents can affect the corridor and strand and delay drivers.

Exhibit 1-3: Speed Limits and Signalized Intersections/Interchanges on SR-12



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Existing Geometric Conditions

The following sections detail the existing physical features, including laneage, median treatments, intersections, and other physical features for the existing conditions as of November 2010.

Exhibit 1-5 and Exhibit 1-6 show the number of lanes and median treatment on SR-12.

Jameson Canyon Segment (PM 0-3.3 Napa, PM 0-2.75 Solano)

The Jameson Canyon section of SR-12 is primarily a two-lane conventional highway between SR-29 and I-80. There is an additional truck climbing lane at each end of this segment. In the eastbound direction, there are two lanes from the intersection of SR-29 to approximately a half-mile east of Kirkland Ranch Road. In the westbound direction, the truck climbing lane extends from I-80 to approximately one mile west of Red Top Road. The main intersections in this segment are SR-29, Kelly Road, Kirkland Ranch Road, and Red Top Road. There are numerous private roads and driveways that access adjacent agricultural properties. The interchange at I-80 includes a flyover ramp from SR-12 eastbound to I-80 eastbound, and an off-ramp from I-80 westbound to SR-12 westbound. There is no direct access from I-80 eastbound to SR-12 westbound or from SR-12 eastbound to I-80 westbound. Access for these movements is provided by way of Red Top Road and the Red Top Road Interchange with I-80.

The outside shoulders do not meet current Caltrans design standards and for most of this segment, are four feet or less. The centerline includes a rumble strip, and passing is not allowed beyond the truck climbing lanes. There are portions of both the horizontal and vertical alignments that do not meet a 55-mph design speed.

Solano Urban Segment (PM 1.8 – 7.8)

The Solano Urban four-lane segment is in the cities of Fairfield and Suisun City. This segment has several roadway classifications because of the combination of interchanges and at-grade intersections. Classifications are shown in Exhibit 1-4. Although the roadway has several classifications, the typical section is generally four lanes, with full standard inside and outside shoulders, and either a median concrete barrier (I-80 to Marina Boulevard) or depressed median (Marina Boulevard to Walters Road). Standard outside shoulders are ten feet, and inside shoulders are five feet or wider. The bridges crossing over Webster Street and the Union Pacific Railroad have narrow shoulders and the adjacent roadways between Webster Road and Marion Boulevard have shoulders below current standards.

Exhibit 1-4: Solano Urban 4-Lane Roadway Classifications

Classification	Post Miles	Beginning Intersection [a]	Ending Intersection [a]
Expressway 4-lane	1.8 - 2.94	I-80	Beck Avenue
Conventional 4-lane	2.94 - 4.12	Beck Avenue	Pennsylvania Avenue
Expressway 4-lane	4.12 – 4.70	Pennsylvania Avenue	Marina Boulevard
Conventional 4-lane	4.70 – 6.47	Marina Boulevard	Lawler Ranch Road
Expressway 4-lane	6.47 – 7.80	Lawler Ranch Road	Walters Road

Note:
Nearest intersection; change in classification takes place at begin/end of intersection elements such as turn lane.

Similar to the I-80 and SR-12 west interchange, the I-80 and SR-12 east interchange does not provide all of the movements to and from SR-12 and I-80. There is an off-ramp from I-80 eastbound to SR-12 eastbound and a flyover ramp from SR-12 westbound to I-80 westbound. The SR-12 and Chadbourne Road Interchange and the I-80 and Abernathy Road Interchange provide access for the I-80 westbound to SR-12 eastbound and the SR-12 westbound to I-80 eastbound movements. This segment of SR-12 has grade-separated interchanges at Chadbourne Road, Jackson/Webster Streets, and Civic Center

Boulevard/Main Street. SR-12 crosses over the Union Pacific Railroad just east of Webster Street in Suisun City. Major signalized intersections with left turn lanes include Beck Avenue, Pennsylvania Avenue, Marina Boulevard, Grizzly Island Road, Lawler Ranch Parkway, and Walters Road. Additionally there are six right-in/right-out accesses to local streets along SR-12.

This segment has the only bicycle path within the study area. The Central County Bikeway, a Class I bicycle facility, extends from the Union Pacific Railroad to Walters Road on the north side of SR-12. This path ties into the City of Suisun City's local streets near the railroad tracks and consists of an eight- to ten-foot wide concrete path.

Solano Rural Segment (PM 7.8 -24.82)

The Solano rural segment is a two-lane conventional highway section extending from Walters Road to Church Road just west of the City of Rio Vista. This segment is a narrow roadway with very narrow outside shoulders. The safety enhancement implementation and recently-completed SHOPP project have improved safety along a majority of this segment. There is a concrete median barrier from just east of Walters Road to just west of Shiloh/Lambie Roads. In this section there is no inside shoulder adjacent to the median barrier, but there are standard eight-foot outside shoulders. East of Shiloh/Lambie Roads to Currie Road, the SHOPP project upgraded the roadway to meet current standards and improved horizontal and vertical alignments. There are two short passing lanes in each direction in this section. In passing lane locations, the existing shoulder is less than two feet wide. East of Currie Road, the existing roadway consists of two lanes, centerline rumble strip with channelizers, and rumble strips on the outside shoulders where the width is at least eight feet. The outside shoulder widths vary between zero and eight feet, with much of this section from Currie Road to the City of Rio Vista having shoulders below current standards. Passing is not permitted in this section, except in the short passing lanes.

There are eight intersections in this segment and six driveway or agricultural accesses. The only intersection that is signalized in this segment is the SR-12 and Summerset Drive/Liberty Island Road intersection that accesses the Trilogy development. Other intersections that accommodate consistent traffic include Scally Road, Denverton Road, Shiloh/Lambie Roads, and SR-133.

Solano City of Rio Vista Segment (PM 24.82 – 26.24)

The City of Rio Vista segment is primarily a two-lane conventional highway section with various turn lanes within the City of Rio Vista limits. This segment extends from Church Road to the Rio Vista Bridge. From Church Road to Drouin Road, the cross section is two lanes with centerline channelizers and a zero- to two-foot outside shoulder. There are steep sideslopes that extend from the edge of the shoulder. From Drouin Road to the Rio Vista Bridge, there are various right turn lanes, wide outside shoulders, and a center (two-way) left turn lane. There are numerous driveway accesses from adjacent businesses and parking is allowed in some locations along SR-12 within the City of Rio Vista limits.

There are stretches of narrow, five-foot sidewalk along SR-12 in Rio Vista. This segment ends at the Rio Vista Bridge. The Rio Vista Bridge is a counterweight vertical lift bridge that spans the Sacramento River. The bridge is two lanes with no shoulders and a narrow four- to five-foot wide sidewalk on both sides of the bridge, accessed via a stairway at the end of the bridge on the west side.

Exhibit 1-5: Existing Conditions on SR-12 – Number of Lanes and Facility Type

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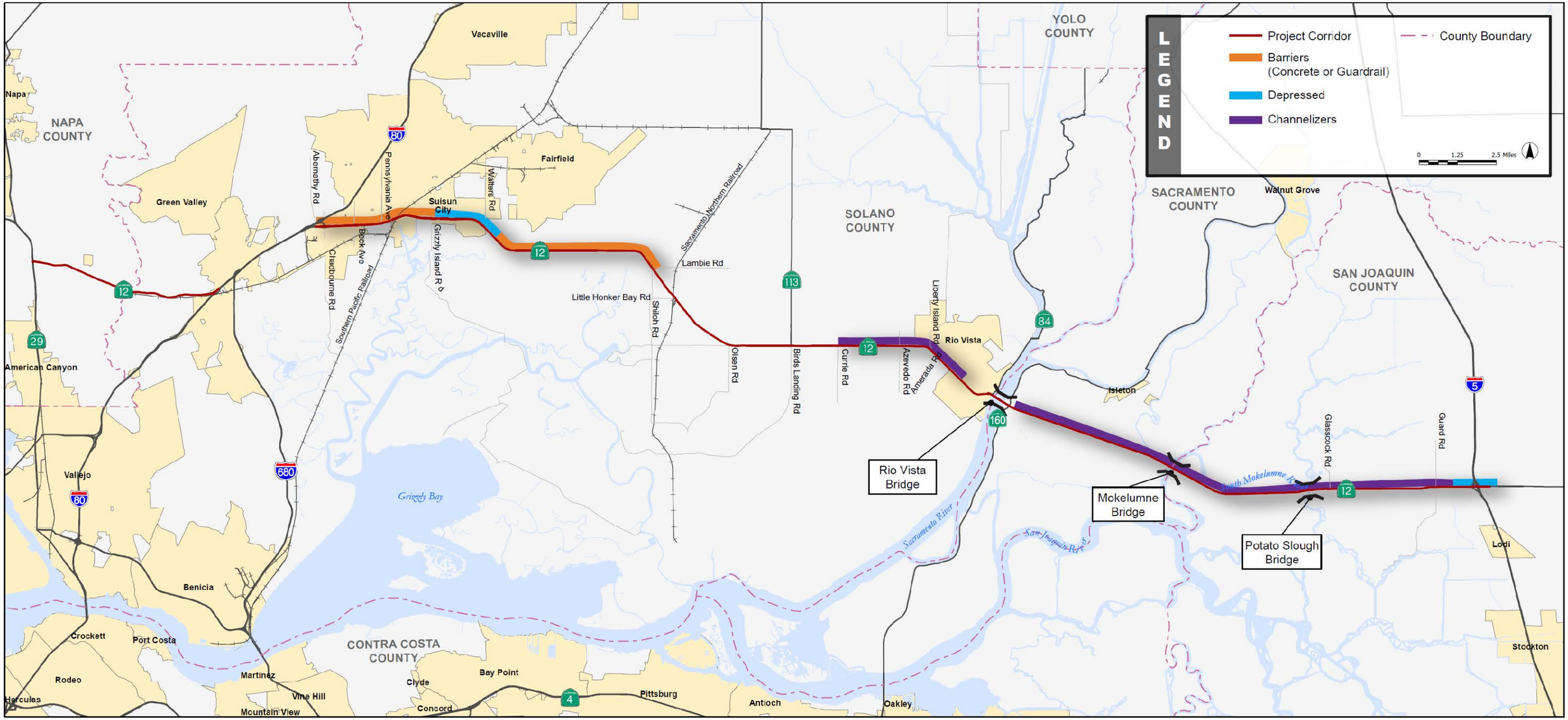
Exhibit 1-6: Existing Conditions on SR-12 – Median Treatments



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The primary intersections in this segment are Hillside Terrace, Gardiner Way, North 5th Street, Virginia Road, and North Front Street. SR-12 and Hillside Terrace Road is a signalized intersection, and North Front Street is accessed by way of right-in/right-out accesses that loop down to North Front Street, which crosses under the Rio Vista Bridge approach structure.

Sacramento Rural Segment (PM 0.0 – 6.2)

The Sacramento rural segment is a two-lane conventional highway that extends from the Rio Vista Bridge to the Mokelumne Bridge. This segment has mostly standard eight-foot shoulders with rumble strips, but there are several areas where the shoulders are approximately six feet wide. For most of this section, passing is allowed. In areas were passing is not permitted, there is a centerline rumble strip. The Mokelumne Bridge is a center pivot swing bridge. The swing portion of the bridge and approach bridges have narrow, three-foot wide outside shoulders. There is a narrow three- to four-foot wide sidewalk on the north side of the bridge. The majority of this segment is below sea level, and there are numerous locations where the roadway has settled around cross drainage pipes causing humps to form in the roadway. There are numerous adjacent and cross irrigation facilities in this segment.

The major intersections are SR-160, Jackson Slough Road, Terminous Road and Brannan Island Road. The intersection of SR-12 and SR-160 is a signalized intersection. Additionally, there are approximately six other driveway/field accesses along SR-12 in this segment.

San Joaquin Rural Segment (PM 0.0 – 10.8)

The San Joaquin Rural segment is similar to the Sacramento segment and is a two-lane conventional highway from the Mokelumne Bridge to close to I-5. Just west of the I-5 interchange, the roadway changes to a four-lane conventional highway. Most of this segment consists of a two-lane roadway with centerline rumble strip with channelizers in the no passing areas. There are standard eight-foot wide outside shoulders with rumble strips for most of the segment. There are several areas that have narrow shoulders, four to six feet in width. This includes the Potato Slough Bridge, which is a center pivot swing bridge. The Potato Slough Bridge has a higher clearance than the Mokelumne Bridge and is opened less than ten times a year on average. There is a five-foot sidewalk on the south side of the Potato Slough Bridge.

The majority of this segment is below sea level, and there are numerous locations where the roadway has settled around cross drainage pipes causing humps to form in the roadway. There are numerous adjacent and cross irrigation facilities in this segment.

The major intersections are W. Terminous Road, Glasscock Road, Correia Road, North Guard Road, I-5 SB Off-Ramp, I-5 NB On-Ramp, North Thornton Road, and North Flag City Road. The intersections near the I-5 Interchange are signalized including the SB Off-Ramp, NB On-Ramp and North Thornton Road. Additionally there are approximately 15 other driveway/field accesses along SR-12 in this segment.

Baseline Conditions

As presented above in the current projects section, there are several projects either recently constructed or that will begin construction and be completed by 2014. These projects will significantly improve the SR-12 Corridor and address many of the existing deficiencies. As such, it is important for this study to consider the baseline conditions that improvement strategies will exist when these near-term improvements are completed so that appropriate can be developed. The following sections discuss the planned changes to the existing conditions in each segment. Exhibit 1-7 and Exhibit 1-8 show the number of lanes and median treatments on SR-12 for the baseline conditions reflecting the addition of near-term improvements. The improvements of

these programmed, near-term projects will be considered in the baseline conditions upon which future conditions analysis and mitigation strategies will be based.

Jameson Canyon Segment (PM 0-3.3 Napa, PM 0-2.75 Solano)

The SR-12 Jameson Canyon Project (Napa EA 04-264134, Solano EA 04-264144) will widen and upgrade this segment of SR-12 to a four-lane conventional highway from SR-29 to Red Top Road. A new concrete median barrier will be constructed and full-standard inside and outside shoulders will be included. A Class II bicycle lane will be provided for the entire eastbound direction of Jameson Canyon and, where feasible, in the westbound direction. Intersections will be upgraded to include additional left and right turn lanes. The horizontal and vertical alignment will be improved to a 55 mph design speed. This project is expected to be advertised for construction in the spring of 2011 and be completed in 2013.

Solano Rural Segment (PM 7.8 – 24.82)

The recently-completed SR-12 Roadway Rehabilitation Project (Solano EA 04-0T10U) and planned SR-12 Roadway Rehabilitation Project (West of Currie Road to Liberty Island Road, Solano EA 04-2A6200) SHOPP projects will upgrade and rehabilitate SR-12 from east of Walters Road to Liberty Island Road (Summerset Drive). These upgrades will include widening so the outside shoulders meet current standards, adding centerline channelizers, and constructing longer passing lanes. There will be two passing lanes in each direction with full-width outside shoulders. The passing lanes are each around 3,500 feet long. The horizontal and vertical alignment will be improved to a 55 mph design speed. Intersection left turn lanes will be added at Currie Road, McCloskey Road, and Azevado Road. The West of Currie Road to Liberty Island project is currently in design and is scheduled to begin construction in 2012 and be completed in 2014.

San Joaquin Rural Segment (PM 0.0 – 10.30)

The Bouldin Island Project (San Joaquin EA 10-0G800) will widen and rehabilitate SR-12 between Mokelumne Bridge and Potato Slough Bridge. These improvements will include full-width shoulders, six-foot inside shoulders, and the addition of a concrete median barrier. The SR-12 Improvement Project will improve the intersections of Tower Parkway, Glasscock Road, Correia Road, and North Guard Road. The SR-12 Improvement Project will also install additional ITS elements to provide driver information along SR-12 and I-5. This project is scheduled for advertisement for construction in the summer of 2012 and should be completed in 2014.

Exhibit 1-7: Baseline Conditions on SR-12 – Number of Lanes and Facility Type

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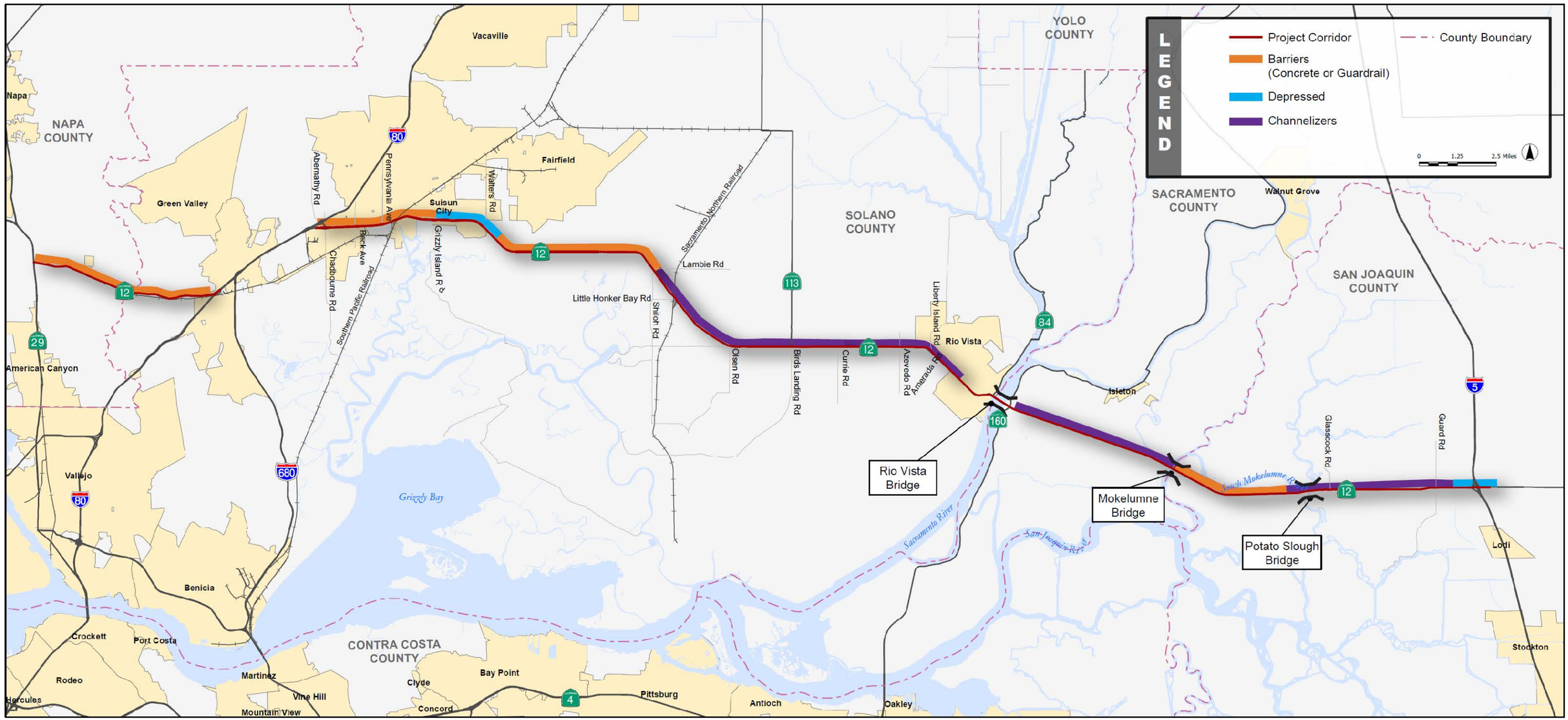
Exhibit 1-8: Baseline Conditions on SR-12 – Median Treatments



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Public Transportation

Public transportation in the SR-12 Corridor currently provides additional mobility options to the automobile. Based on travel demand modeling for the county, transit mode share in the corridor is on the order of 2%[3], which is not a significant share. The major transit services operating in the corridor are bus routes provided by Fairfield and Suisan Transit (FAST), Rio Vista Delta Breeze, and South County Transit (SCT/LINK) in Galt.

Exhibit 1-9 presents the service characteristics of transit providers operating in the SR-12 Corridor, based on transit agency information. Exhibit 1-10 depicts public transportation services within the SR-12 Corridor.

Exhibit 1-9: Weekday Transit Service in the SR-12 Corridor

Transit Agency/Route	Average Weekday Ridership	Direction	Weekday Service			
			Hours	Frequency (in minutes)		
				Morning	Midday	Evening
Fairfield/Suisun Transit (FAST)						
Express Route 90	840	WB	4:10 AM - 7:30 PM	15-35	60	8-60
		EB	5:00 AM - 8:12 PM	17-43	60	9-33
Local Route 5	185	Circular Route	7:30 AM - 7:22 PM	30	30	30
Local Route 8	95	Circular Route	7:05 AM - 7:00 PM	60	60	60
Rio Vista Delta Breeze						
Route 50 SR-12 Express	20	EB	8:00 AM - 8:15 PM	1 bus	2 buses	2 buses
		WB	5:20 AM - 5:25 PM	3 buses	2 buses	1 bus
Route 52 SR-160 Express	5	NB	5:50 AM - 6:20 PM	1 bus	1 bus (overlaps AM)	1 bus
		SB	7:00 AM - 7:20 PM	1 bus	1 bus	1 bus
SCT/LINK						
Delta Route	20	EB	9:00 AM - 5:35 PM	Three round trips between Isleton and Lodi via SR-160 and SR-12		
		WB	10:15 AM - 6:10 PM			

Source: www.fasttransit.org; www.rio-vista-ca.com/transit; www.sctlink.com.

Notes:

1. Route 90 FAST ridership is based on FY 09/10 annual ridership from STA's Transit Program Manager.
2. SCT/LINK Delta Route daily ridership is based on average monthly ridership from STA/LINK. Additional service times to Galt at the beginning and end of day not shown in table.
3. Delta Breeze daily ridership is from July-September 2010, Rio Vista Delta Breeze Summary Report FY 2010-11.
4. FAST local route weekday ridership estimated from FY 09/10 annual ridership.

FAST

Fairfield and Suisun Transit (FAST) is the local transit system for the Cities of Fairfield and Suisun City and also operates many of the Solano Express regional routes. Only the bus routes that operate on SR-12 are addressed here, including express Route 90 and local routes 5 and 8. Route 90 operates Monday through Friday via SR-12 and I-80 between the Suisun Amtrak Station, the Fairfield Transportation Center, and the El Cerrito del Norte BART Station. Midday runs do not serve the Amtrak Station, which provides access to the Capitol Corridor service to Sacramento and San Jose. Routes 5 and 8 provide local Fairfield service Monday through Saturday and also stop at the Amtrak Station

3 *State Route 12 Corridor Transit Study,* prepared for Solano Transportation Authority and Napa County Transportation Planning Agency by Urbitran Associates, January 2006, p. 55.

Rio Vista Delta Breeze

Rio Vista Delta Breeze offers deviated fixed route bus service within the City of Rio Vista and between Isleton, Rio Vista, Fairfield, Suisun City, Pittsburg/Bay Point BART Station and Antioch with connections to Lodi. Delta Breeze operates two routes on SR-12 that operate Monday through Friday: Route 50 SR-12 Express and Route 52 SR-160 Express. Route 50 serves Fairfield to Rio Vista to Isleton via SR-12 and SR-160, with stops at the Suisun Amtrak Station and the Fairfield Transportation Center. Route 52 runs from Rio Vista and Isleton to the Pittsburg/Bay Point BART Station on SR-12, SR-160 and SR-4. Both routes connect with the SCT/LINK Delta Route to Galt and Lodi in Isleton.

SCT/LINK

South County Transit (SCT/LINK) provides transit service for the City of Galt and operates its Delta Route between Galt and Lodi on SR-160 and SR-12, with connections to Delta Breeze Route 50 SR-12 Express and Route 52 SR-160 Express in Isleton. It makes three round trips per weekday, with one additional trip between just Galt and Isleton.

Transit Summary

There is limited public transit service in the SR-12 Corridor. Existing fixed route transit service along SR-12 between I-80 and I-5 provides less than half a dozen trips per direction per weekday except within Fairfield and requires transfers to travel the full length of the corridor. The transit mode split is low and, while serving important transportation needs in the corridor, does not play a substantial role in the corridor trip making. The local transit services provide good connections to the inner San Francisco Bay Area via FAST Route 90 to the El Cerrito del Norte BART Station and transfers at the Suisun Amtrak Station to the Capitol Corridor Service, which also serves the Sacramento-Auburn area. Delta Breeze Route 52 SR-160 Express also provides three round trips per day from Rio Vista to the Pittsburg/Bay Point BART Station.

Bicycle Facilities

The following bicycle facilities exist along the SR-12 Corridor:

- A 2.7-mile Class I bicycle path between Marina Boulevard and Walters Road in Suisun City;
- A 6.1-mile Class II bicycle path between Walters Road and Shiloh Road; and
- A Class I bicycle path on the north side of SR-12 between Marina Boulevard and Capitol Corridor train station on Main Street in Suisun City.

The following bicycle facilities are planned for the corridor:

- A 20-mile Class II bicycle lane or Class III bicycle route between the Rio Vista Bridge and Walters Road developed by improving shoulders along SR-12;
- Class II bicycle lane improvements along Jameson Canyon Road from Red Top Road to the Napa County Line as part of the Jameson Canyon Segment (PM 0-3.3 Napa, PM 0-2.75 Solano) project. And
- A 0.6-mile Class I bicycle multi-use path along the north side of SR-12 from Marina Road to the Amtrak Station in Suisun City.

Existing and proposed bicycle facilities are shown in Exhibit 1-11.

Exhibit 1-10: Public Transportation in the SR-12 Corridor as of November 2010

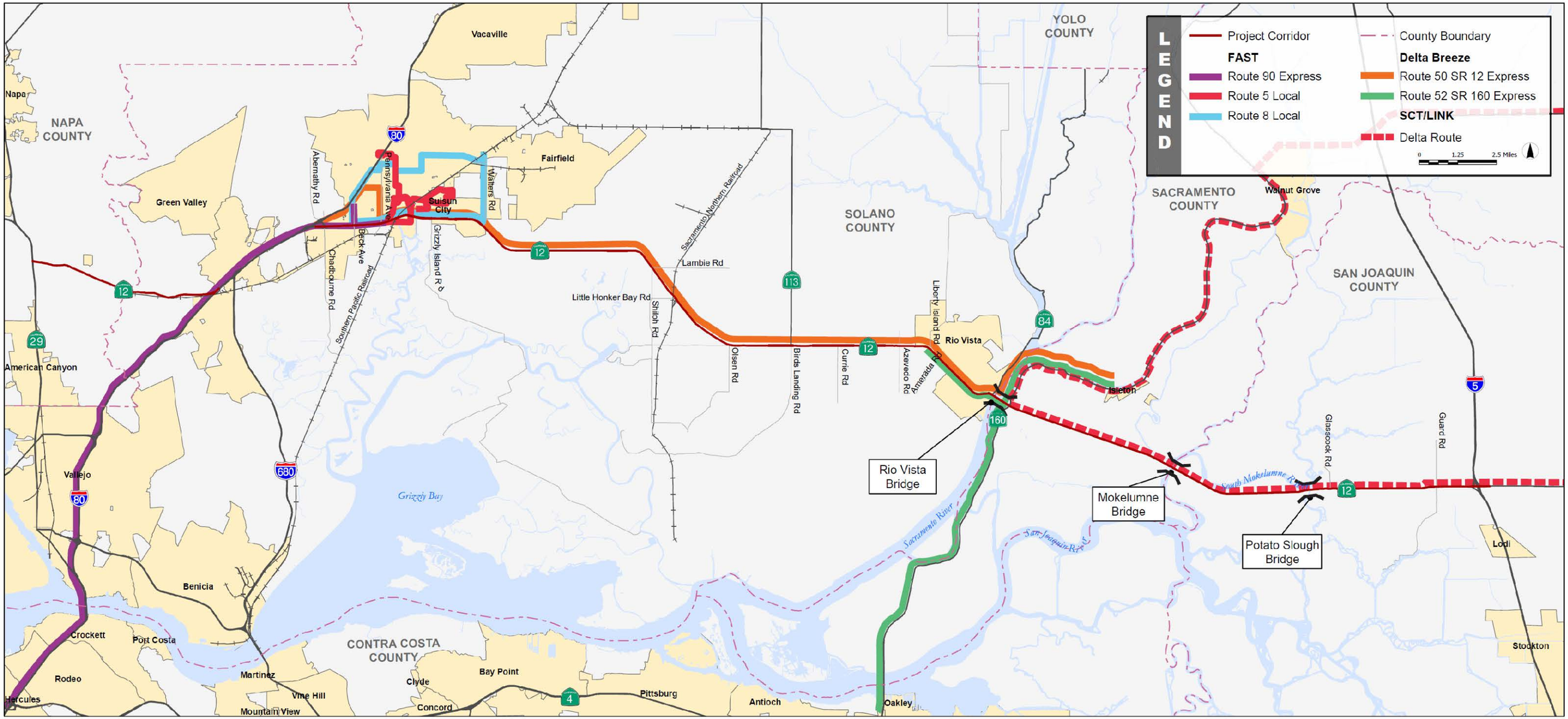

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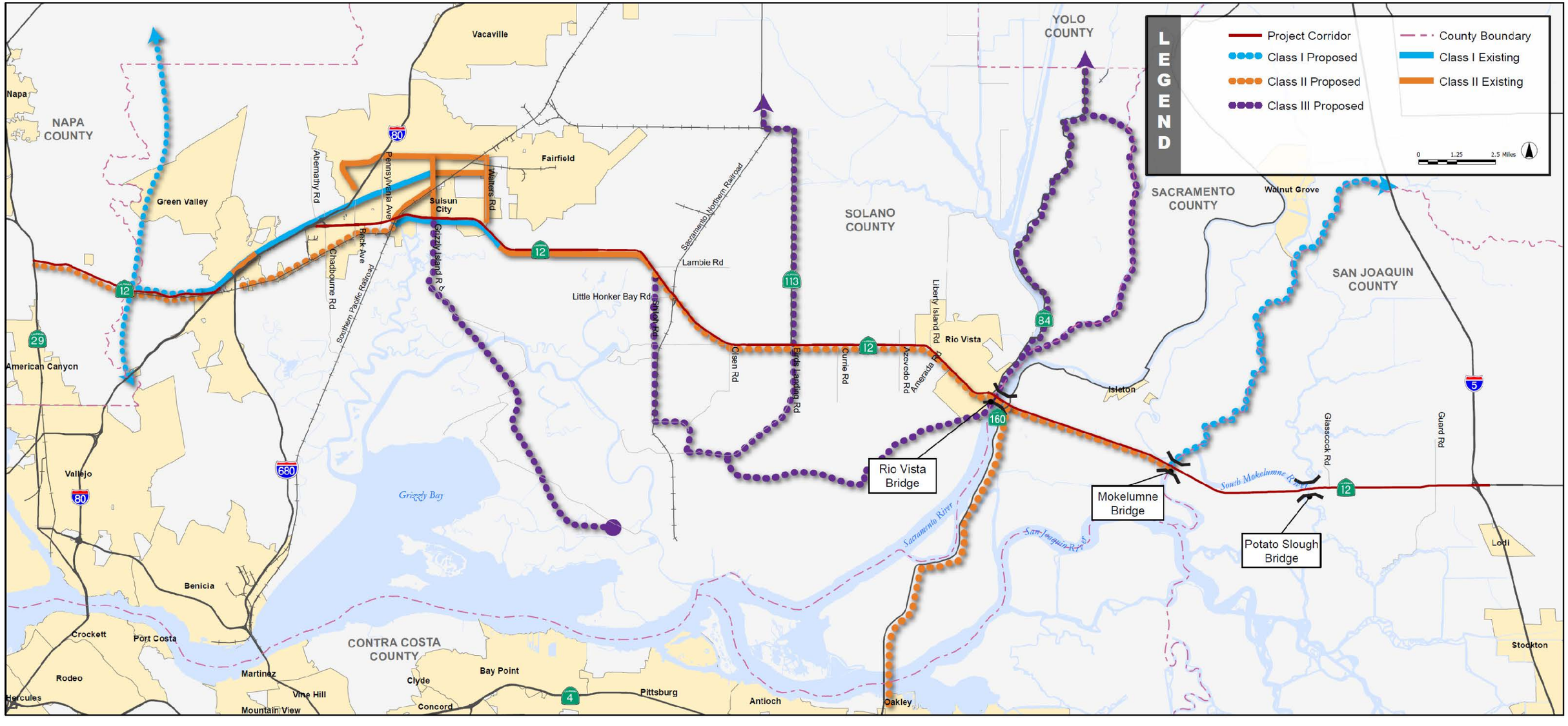
Exhibit 1-11: Bicycle Facilities in the SR-12 Corridor (Existing and Proposed)



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Marine Transportation

Marine Highway Corridor

The U.S. Department of Transportation (USDOT) and the Maritime Administration (MARAD) manages America's Marine Highway Corridors, a system of all-water routes that can serve as extensions of the surface transportation system. These corridors identify routes where water transportation presents an opportunity to offer relief to landside corridors that suffer from traffic congestion, excessive air emissions or other environmental concerns and other challenges. By designating these Marine Highway Corridors, the USDOT is taking the first step to focus public and private efforts to use the waterways to relieve landside congestion and attain other benefits that waterborne transportation can offer in the form of reduced greenhouse gas emissions, energy savings and increased system resiliency.

The M-580 Marine Highway Corridor includes the San Joaquin River, Sacramento River, and connecting commercial navigation channels, ports, and harbors from Sacramento to Oakland. The USDOT awarded the Ports of West Sacramento, Oakland, and Stockton a joint $30 million grant through the Transportation Investment to Generate Economic Recovery (TIGER) Grant program. This funding will enable the Ports of West Sacramento, Oakland, and Stockton to begin a Marine Highway, which will take 350 containers on each trip from the Valley to the Port of Oakland, reducing the number of drayage trucks on the already congested highway.

Ferry System

There are five ferries remaining in the Delta, three of which lead to islands that are private property and two that are operated by Caltrans and provide public access. The *Real McCoy*, a free-running (no cable) ferry serves vehicles across Cache Slough to the west side of Ryer Island. The ferry landing is on SR-84 in Rio Vista, just north of SR-12. The *J-Mack* is a cable-drawn ferry across Steamboat Slough connecting the east side of Ryer Island to Grand Island at Howard's Landing. Both ferries operate 24 hours a day except for lunch breaks and take about 3 to 5 minutes to cross. The three private ferries include a cable-drawn ferry across Little Connection Slough at Herman & Helen's Marina, a cable-drawn ferry across Middle River to Woodward Island, and a free-running ferry from Jersey Island to both Webb Tract and Bradford Island.

Rail Transportation

There are two rail facilities in the SR-12 Corridor: the Sacramento Northern Railroad, which crosses SR-12 near Shiloh Road, and the Union Pacific Railroad which passes through Fairfield and crosses SR-12 in Suisun City. The Union Pacific Railroad connects the Port of Oakland with SR-12 in Suisun City and is a major freight route. It is also part of the Capitol Corridor, a State-supported Amtrak inter-city rail service line. The Capitol Corridor service is operated and administered by the Capitol Corridors Joint Power Authority (CCJPA).

Intelligent Transportation Systems (ITS) Features along the SR-12 Corridor

ITS plays an effective role in the operations of a transportation network by collecting travel information, such as traffic congestion and delays, and broadcasting it to system users to improve the overall utility of the system. In addition, ITS infrastructure is a significant safety enhancement and a critical component of emergency response and incident detection and recovery, which reduces delays caused by vehicle breakdowns, incidents, and accidents along the SR-12 Corridor.

The existing inventory of ITS infrastructure implemented along the SR-12 Corridor is depicted graphically in Exhibit 1-12. As shown in this figure, most of the existing fully operational ITS infrastructure is located in the western segment of the SR-12 Corridor from I-80 to the Rio Vista Bridge. The existing ITS elements currently servicing the corridor include:

- Portable Changeable Message Signs (PCMS)
- Speed Radar Signs (or Driver Feedback Signs)

Proposed ITS improvements along the SR-12 Corridor are also noted in Exhibit 1-12. These proposed improvements are mainly concentrated within the eastern segment of the corridor and would expand ITS coverage from the Rio Vista Bridge to I-5. These improvements are included in the programmed projects discussed above under Current Projects, and will be considered as part of the Baseline Conditions upon which the future conditions analysis and mitigation strategies will be based. Proposed improvements include the implementation of ITS features such as:

- Extinguishable Message Signs (EMS) – at either approach of the Rio Vista Bridge;
- Changeable Message Signs (CMS) – at the intersection of SR-12 and Jackson Slough Road; and
- Traffic Monitoring Station (TMS) – installed throughout the eastern segment of the corridor from the Rio Vista Bridge to N Thornton Road just past I-5.

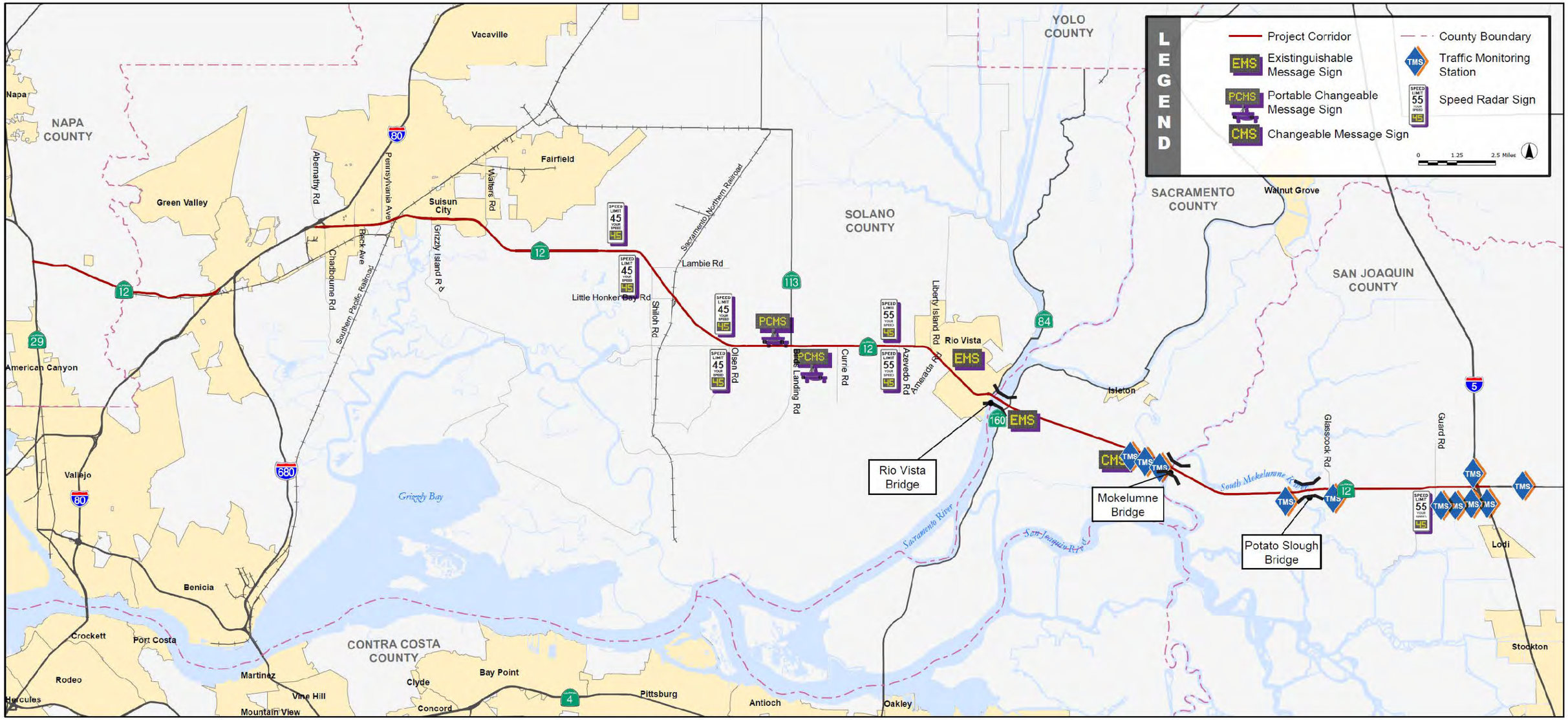
The Delta and Suisun Marsh

The Sacramento-San Joaquin River Delta, including the Suisun Marsh, is one of California's most important natural resources. The Delta region is the largest estuary in the western United States. An extensive levee system maintains the waterways and islands that define the Delta and Suisun Marsh and protects property, infrastructure, environmental resources, and the region's water supply. The SR-12 Corridor is built primarily on engineered fill and passes through the Suisun Marsh and the Delta. The corridor traverses the low-lying region while segments in Sacramento and San Joaquin County are 10 to 15 feet below sea level. The Delta and Suisun Marsh present a variety of challenges for transportation along the SR-12 Corridor, including geologic conditions, levee stability, and susceptibility to effects of climate change, flooding, sea level rise, and even fog.

Geology and Geotechnical Issues

The Delta area soils present many issues to the SR-12 Corridor through the Sacramento and San Joaquin County segments. The lengths of these segments are approximately 14 miles, 33% of the entire corridor (I-80 to I-5). The existing soils include thick peat and clay layers which are highly compressive. These areas have experienced substantial subsidence over the decades causing differential settlement of the SR-12 roadway corridor and resulting in pavement cracking and humps at drainage elements. These settlement issues have long been a major focus of maintenance crews to maintain a serviceable travel way. Engineered structural pavement sections are required to increase the service life of pavement in the Delta area. These engineered structural sections are significantly more expensive than standard roadway pavement structural sections.

Exhibit 1-12: Existing and Planned ITS Infrastructure in the SR-12 Corridor



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An example of the challenges associated with the existing soils, roadway rehabilitation was completed in 1995 in the Bouldin Island area consisting of a pavement reinforcing mesh to strengthen the existing structural pavement section to better resist differential settlement and cracking. The project had a design life of 10-years but within three years, signs of distress began to appear and pavement condition surveys identified the need to rehabilitate the pavement.

Construction of roadway widening and associated fills is expected to require geotechnical investigations and engineering to develop solutions for the compressible soils. For previous improvements, geotechnical engineering solutions have considered wick drains, surcharge loading, lightweight fill, staged construction, and instrumentation programs to mitigate long-term settlement damage resulting from the new fill placement. These costs will need to be considered when developing mitigation strategies and costing improvements in these areas of compressible soils.

Detailed soils information and maps can be obtained via the California On-line Soil Survey Manuscripts website, United States Department of Agriculture, Natural Resources Conservation Service.

Levee System

The Delta has approximately 1,100 miles of levees, many of significant height (up to 25 feet). The Suisun Marsh has over 220 miles of exterior levee that protect over 50,000 acres of managed wetland habitats and public and private infrastructure. The levees are primarily privately maintained and are considerably smaller in height and width than those in the Delta.

Many of the local levees in the Delta started out as 3 to 5-foot-high dikes of peat over a century ago. Modern engineering analyses and techniques were not available during the initial construction of the levees which generally rest on the original marsh soils. Over time, the weight of the levees compressed and displaced the soft, organic soils beneath them. In addition, the organic soils within the island interiors oxidized and were removed by wind over time, resulting in the land surface significantly subsiding. As a result, the levees have to be continually raised and broadened, which commonly initiates further settlement, embankment cracking, and loss of freeboard. This process will continue until the levees and their foundations stabilize, and many reaches have not yet stabilized to date. Delta levees today are now commonly 15 to 20 feet high, and often protect island interiors that are 10 to 15 feet below sea level. Permeable lenses in the levee and foundation, together with historic relics, such as abandoned pipes, and constant burrowing by various mammals, also commonly result in seepage distress and internal erosion.[4]

During the last century, there have been 162 Delta levee failures leading to island inundations. In many cases, the flooding of the islands has been extremely costly to both local residents and farmers, and to the State as a whole. Levee failures in the Suisun Marsh have also occurred with significant impacts to local and statewide interests. In February 1998, 11 exterior levee breaches in the Suisun Marsh resulted in the inundation of over 22,000 acres.[5] Records on Suisun Marsh levee failures are incomplete; however failures in Suisun Marsh are more frequent due to the lower crest elevations of it levees. In a few places, the levees have been lowered to allow tidal exchange and tidal wetland restoration.[6]

Along SR-12, the number of occurrences of inundation has been rare. In the first decade of 1900, there were several occurrences of inundation in the Brannan, Bouldin and Terminous tracts caused by levee failure. However, since that time there have been only two recorded occurrences: once in 1958 in the Terminous tract and once in 1972 in the Brannan tract.[7]

4 California Department of Water Resources. 2008 (May 15). *Technical Memorandum: Delta Risk Management Strategy (DRMS) Phase 1, Topical Area: Levee Vulnerability.* URS Corporation/Jack R. Benjamin & Associates, Inc.
5 California Department of Water Resources. 2008. Op cit.
6 California Department of Water Resources. 2008. Op cit.
7 CALFED. 1998 (March). *Historical Inundations*.

The existing levee system is vulnerable to failure due to seismic activity, high-water, and even dry-weather risks. Seismic risk in the Delta is characterized as moderate-to-high because of many active faults in the San Francisco Bay Area.[8] A major earthquake of magnitude 6.7 or greater in the vicinity of the Delta Region has a 62 percent probability of occurring sometime before 2032. This could cause multiple levee failures. While earthquakes pose the greatest risk to the levees, winter storms and related high water conditions are the most common cause of levee failures in the Delta. Under "business-as-usual" practices (current management practices and regulatory controls), high water conditions could cause about 140 levee failures in the Delta over the next 100 years.[9] In Suisun Marsh, the seismic-induced deformations of the levees under strong shaking are large as a result of deep, very soft clay deposits forming at the levee foundation.[10]

Since the 1930's, levee failure events have resulted in socio-economic impacts, island and tract flooding, and have affected land use. These effects pose a threat to the interregional and marine transportation, railroad, and freight and goods movement. The cost of repair to infrastructure assets, including pipelines, power transmission lines, highways and roads, railroads, residences, commercial buildings, industrial facilities, and public facilities due to inundation from levee failures would be extensive. In addition to economic consequences, there would be impacts to water quality, ecosystem consequences, and public health and safety consequences.

Roadways and highways may be damaged by inundation due to levee failure, but would likely not fail and result in temporary loss of service. The time required to repair damaged roadways and highways would depend on the extent of damage and accessibility to repair, and are estimated to be one week after island pump out for Interstate Highways, three months for State Highways, and six months for other roadways.[11]

Climate Change

Climate change is occurring now in California. Observations show warming in California during the last 50 to 100 years. This warming trend has been shown to be too rapid to be explained as a natural phenomenon alone. Most likely, increasing atmospheric greenhouse gases (due primarily to hydrocarbon use) have contributed. Temperatures have increased, a higher fraction of precipitation comes in the form of rain, measurements show less snow on the ground, peak river flows are coming earlier in the year, and mean and maximum sea levels have increased.

As climate change progresses, these trends will continue and will affect levee vulnerability. Mean water levels in the Delta will increase as sea level rises. In addition, peak river inputs to the Delta will likely increase due to stronger winter river flows, as well as possible increases in mean precipitation rates and single-day precipitation amounts. In-Delta wind speeds may also increase, due to predicted increases in the large-scale temperature and pressure gradients that drive these flows.

Climate change will affect Delta levees due to elevated flood risk through altered river flows on daily and seasonal timescales (affecting water levels), increased sea level (affecting water levels), and changes in wind speeds and directions in the Delta (affecting wind/wave action). Less obvious effects include a possible acceleration of the subsidence of Delta islands in response to higher soil temperatures. All of these may be occurring now or may occur in the future and could contribute to increased flood risk and levee failure in the Delta and Suisun Marsh.[12]

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8 California Department of Water Resources. 2009 (February).*Delta Risk Management Strategy (DRMS) Phase 1,* URS Corporation/Jack R. Benjamin & Associates, Inc.

9 California Department of Water Resources. 2009. Op cit.

10 California Department of Water Resources. 2008. Op cit.

11 California Department of Water Resources. 2007 (June 15). *Technical Memorandum: Delta Risk Management Strategy (DRMS) Phase 1, Topical Area: Impact to Infrastructure.* URS Corporation/Jack R. Benjamin & Associates, Inc.

12 California Department of Water Resources. 2008 (January 25). *Technical Memorandum: Delta Risk Management Strategy (DRMS) Phase 1, Topical Area: Climate Change.* URS Corporation/Jack R. Benjamin & Associates, Inc.

Sea Level Rise

A growing concern in coastal communities is the potential impacts to infrastructure caused by sea level rise in the coming decades and centuries due to global climate change. Sea level rise has impacts felt well beyond coastal regions. The San Francisco Bay Conservation and Development Commission (BCDC), and The Delta Protection Commission have been studying potential impacts related to sea level rise. Caltrans has also begun looking at infrastructure that could be threatened by sea level rise and are developing design approaches for new and reconstructed facilities in coastal areas that account for sea level rise and associated wave run-up. It has been determined that the probability of occurrence of sea level rise and storm surge has a virtual certainty greater than 99 percent.[13]

SR-12's low elevation areas face the greatest threat from rising sea level, particularly during high storm tide events. The SR-12 Corridor, south of Travis Air Force Base and north of Suisun Marsh, is in a low-lying area. The corridor is largely constructed on a filled causeway; culverts under the highway allow water to drain to the south into Hill Slough and Nurse Slough watersheds in this area. The section of SR-12 east of the Rio Vista Bridge nearly to I-5 is all below sea level and contained by levees. Although it is not yet clear what the future of this levee system is or its vulnerability to increased sea level rises, the majority of the levees throughout the Delta are not generally believed to be able to withstand the additional water pressure from the projected rise in sea level. The rise in sea level coupled with the soil condition increases the likelihood of levee failure.

In addition to SR-12, there is a significant amount of infrastructure in the Delta including utilities, pipelines, and the BNSF Railroad with segments below sea level and protected by levees. These effects pose a threat to the interregional and marine transportation, railroad, and freight and goods movement. Rising sea level and higher winter water flows are likely to cause a variety of significant problems, including disruptions to railroads, pipelines and roadways, and shipping into and out of the ports of Stockton and Sacramento.

Several estimates of potential sea level rise have been developed. The Delta Vision Blue Ribbon Task Force, consulting with local governments and technical and scientific advisors, has prepared forecasts that the sea level will rise by 55 inches in 2100. In 2050, the Task Force predicts that the sea level will rise by 16.1 inches. This interim guidance has been endorsed by Caltrans until such time as more refined forecasts are developed, anticipated in 2012.[14] These predictions are based on hydraulic modeling conducted by the United States Geological Survey (USGS). It should be noted that these predictions may underestimate the sea level rise as they are derived primarily by thermal expansion of the oceans, and do not attempt to parameterize ice melt. The BCDC has published maps showing sea level rise for part of the SR-12 Corridor, but their geographical limits do not include Sacramento or San Joaquin Counties. Exhibit 1-14 shows the approximate locations along the corridor to be affected by sea level rise at the end of the century. This exhibit was developed by overlaying geospatially-referenced data layers[15] presenting potential inundation due to rising sea levels in the San Francisco Bay Region with corridor mapping.

By 2100, a 55-inch sea level rise scenario suggests that about 350 miles of major State highways in California could be at risk along the coastline, the Delta region, and interior waterways. The physical impacts and economic costs of such sea level rise are still under study.[16] Exhibit 1-13 shows the total centerline miles potentially affected by sea level rise.

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13 California Department of Transportation. 2009 (February). Vulnerability of Transportation Systems to Sea Level Rise, Preliminary Assessment.

14 United Nations Intergovernmental Panel on Climate Change

15 Knowles, Noah. 2010. Potential Inundation Due to Rising Sea Levels in the San Francisco Bay Region. *San Francisco Estuary and Watershed Science*, 8:1. Available at http://escholarship.org/uc/search?entity=jmie_sfews;volume=8;issue=1. Data from website: http://cascade.wr.usgs.gov.

16 California Department of Transportation. 2009. Op cit.

Exhibit 1-13: SR-12 – Sea Level Rise Effect

County	Centerline Miles Affected	
	16-inch Rise (2050)	55-inch Rise (2100)
Solano	1.86	3.56
Sacramento	5.74	5.74
San Joaquin	10.01	10.01
Total Affected Length	17.61 (~42% of project length)	19.31 (~46% of project length)
Source: PBS&J, 2010; USGS; Department of Water Resources (DWR)		

Because the signs of climate change and rising sea level are already visible, State agencies must prepare for the potential impact that is expected. Any resulting disruption to the transportation system will have immediate impacts. Caltrans is currently developing guidance and adaptive strategies for this change and to apply economic perspective in establishing this guidance to ensure cost-effective responses and consideration of the wide economic costs and benefits of adaptation to climate change and rising sea level.[17]

In subsequent phases of this study, it will be important to identify mitigation strategies for anticipated impacts of these risks to levees and potential inundation. Such mitigation may include establishment of emergency response plans for inundation, development of alternative routes, and even new design and construction standards for roadways vulnerable to levee failure and inundation.

Fog

The presence of fog along the SR-12 Corridor is fairly common, especially through San Joaquin and Sacramento counties and the Suisun Marsh area. Fog tends to be more prevalent during autumn, winter, and early spring, can be highly variable along the roadway, and can result in almost zero visibility.

In review of accident records from 2006 to 2009, there have been 13 fog-related accidents on SR-12 through the study area. Several of these also involved other causes, including alcohol or speeding. All fog-related accidents occurred in the months between October and February. As a percentage of all accidents, fog-related accidents make up a small percentage – less than 2% of all accidents. While fog-related accidents do not appear to be as significant an issue along SR-12 as they are in other areas of the Central Valley, they nevertheless warrant consideration in development of mitigation strategies. Advance warning signs have been used effectively by Caltrans on other routes.

Summary of Section 1

This section presents a summary of the basic features of the corridor including information on previous studies and current projects; travel markets served; alternative modes of travel; existing geometric conditions; public, rail and marine transportation; intelligent transportation systems (ITS); geologic conditions; and climate and weather conditions, including areas of risk to potential sea level rise. A summary of key issues addressed in this section include:

- *Baseline Conditions*: Substantial improvements have been implemented and further improvements are programmed in the SR-12 Corridor to enhance safety and improve geometry and traffic operations. The results of these recently completed and planned projects will correct many of the deficient existing conditions. The baseline conditions for this Study include recently completed and planned projects that will be constructed by 2014. These baseline conditions form the basis for analysis of future conditions and will be used to develop improvement strategies.

[17] California Department of Transportation. 2009. Op cit.

- *Public Transportation:* There is limited public transit service in the SR-12 Corridor. While serving important transportation needs in the corridor, public transit does not play a substantial role in the corridor trip making.
- *Proposed Marine Highway:* The M-580 Marine Highway Corridor plays a vital role in delivery of cargo through the corridor. The proposed marine highway extension to the Ports of West Sacramento, Oakland, and Stockton may reduce the number of trucks on the corridor.
- *Geology and Geotechnical Conditions:* Highly compressible soils throughout segments of the corridor may require specialized geotechnical engineering solutions to allow for roadway construction and other improvements that may be identified as part of the mitigation strategies for the corridor. These costs will need to be considered.
- *Levees and Flooding:* The extensive levee system that protects public and private infrastructure, including SR-12, from flooding is vulnerable to failure due to seismic activity, high-water, and even dry-weather risks. These levees have experienced failures in the past resulting in inundation along SR-12. The potential for levee failure and inundation is exacerbated by the climate change occurring now and expected to progress and the potential for sea level rise.
- *Fog:* While fog is fairly common along the SR-12 Corridor, especially through San Joaquin and Sacramento counties and the Suisun Marsh area, it doesn't appear to result in a significant number of accidents in the corridor.

These key issues will be evaluated during the development of the future conditions analysis to determine the impact of forecasted conditions and to identify improvement strategies to mitigate corridor safety, congestion, and operational issues along the corridor.

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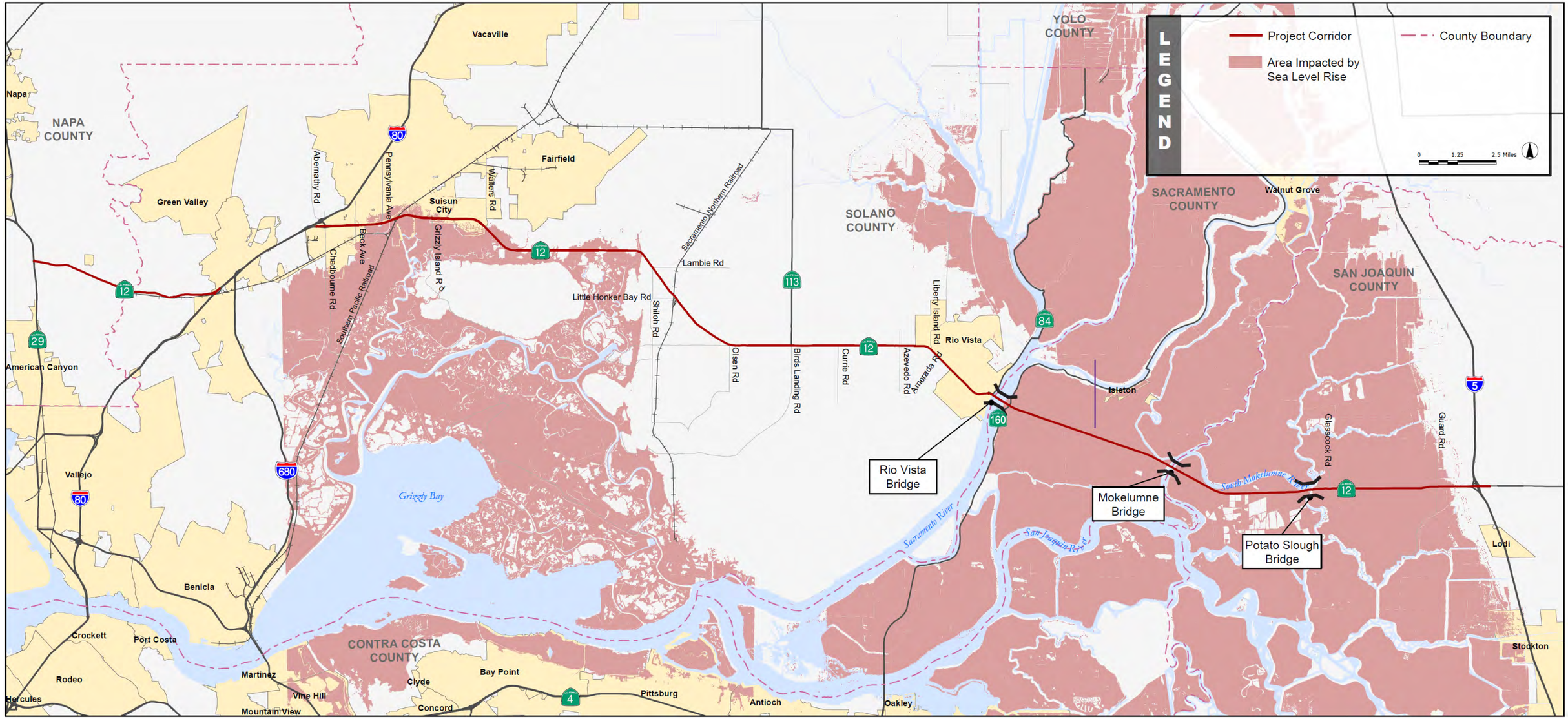
Exhibit 1-14: SR-12 – Sea Level Rise (2100)



Note: Based on San Francisco Bay Conservation and Development Commission "Shoreline Areas Vulnerable to Sea Level Rise." Data used to derive this figure compiled from Knowles, Noah. 2010. Potential Inundation Due to Rising Sea Levels in the San Francisco Bay Region. *San Francisco Estuary and Watershed Science*, 8:1. Available at http://escholarship.org/uc/search?entity=jmie_sfews;volume=8;issue=1. Data from website: http://cascade.wr.usgs.gov. . Data does not account for existing shoreline protection or wave activity. Assumptions include an approximate 55-inch sea level rise in 2100 and some levee breaching and/or overtopping in areas.

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Section 2: Geometric Evaluation of SR-12

This section provides an evaluation of the baseline conditions geometric features. As previously described, many substandard geometric features are being improved with recently-completed and planned projects. These improvements are included in the programmed projects discussed in Section 1 under Current Projects, and will be considered as part of the Baseline Conditions upon which the future conditions analysis and mitigation strategies will be based. This evaluation was completed on areas outside the limit of these near-term projects. Geometric features include Alignments (horizontal and vertical), Cross Section Elements (shoulder widths, median treatments, bicycle facilities, and sideslopes), and Bridge elements.

Alignment

Horizontal and vertical alignment geometry is defined by the design speed of the roadway. (Horizontal alignment defines the roadway curves and tangent sections; vertical alignment defines the grades, crests, and valleys along the roadway.) Many of the projects that are improving SR-12 include upgrading the alignments to a 55 mph design speed. Much of the corridor has a posted speed limit of 55 mph; therefore a minimum design speed of 55 mph is appropriate for this type of facility. This means that, where the roadway meets or exceeds the criteria for a 55 mph design speed standard, the roadway can safely accommodate traffic moving at 55 mph. Where the roadway fails to meet the criteria for 55 mph design speed standard, it cannot safely accommodate traffic moving at 55 mph. The criteria that establish design speed include sight distances, stopping distances, horizontal and vertical curvature, land and shoulder widths, and similar criteria.

Horizontal Alignment

Horizontal alignment elements are the combination of the curve radii and corresponding roadway cross slope or banking (superelevation). The SR-12 Corridor has several large radii horizontal curves as it passes through Solano County. The horizontal alignment in Sacramento and San Joaquin County is relatively straight with some slight curves. The majority of the curves on SR-12 have radii over 3,000 feet, which with a superelevation of 4%, would meet or exceed the 55-mph design speed criteria. There are three curves in the rural Solano segment that have radii between 1,800 to 2,200 feet. The 1,800-foot curve will be improved with the second Solano County SHOPP (West of Currie Road to Liberty Island Road) project. The remaining existing curves appear to have superelevation in the 6-7% range that would meet standards for alignment.

The alignment through Rio Vista includes two tighter curves with radii of 1,600 and 1,250 feet. The posted speed limit through the City is 35 mph, and the design speed is also 35 mph, which is appropriate for the posted speed. These tighter radii help to slow traffic as it enters and passes through the town. However, the 1,250-foot radius curve approaching the Rio Vista Bridge does cause sight distance issues because of the lack of shoulders on the bridge. Sight distance approaching the bridge from the west is compromised because of the bridge guardrail and the tight curve. Additionally, the location of signal equipment that warns drivers when the bridge is opening compounds this sight distance deficiency.

Vertical Alignment

The SR-12 Corridor between I-80 and I-5 is relatively flat. SR-12 in Solano County includes a series of moderate grades and vertical curves. The roadway profile gradually descends in elevation as it follows the low-lying region though the Suisun Marsh and into the Delta. Solano County topography can be classified as rolling terrain. All of the vertical alignment deficiencies in Solano County will be improved by the SHOPP projects and the Jameson Canyon project. In Sacramento and San Joaquin Counties the terrain can be classified as level terrain. The structure approaches in Sacramento and San Joaquin account for the only significant change in the roadway grade. The bridge approach grades approaching the Mokelumne Bridge and Potato Slough Bridge are approximately 3 to 4%.

The roadway elevation varies though each of the counties as a result of the low-lying regions and natural topography of the central valley and the Delta. Portions of the Solano County sit 10 feet above sea level while most of the corridor within Sacramento and San Joaquin Counties are situated as low as 15 feet below sea level, with few areas above sea level between Rio Vista and I-5.

Cross Section Elements

Cross section elements include lane and shoulder widths, median treatments, bicycle facilities, and sideslopes. On two-lane roadways, proper lane and shoulder widths are generally considered the most important design elements for safe facilities, particularly on facilities that are approaching maximum capacity as are several segments along SR-12. Additionally, shoulder widths and sideslopes play an important role in CHP enforcement and emergency response.

Lane and Shoulder Widths

Field observation and review of aerial photographs indicate that the majority of the lane widths in the SR-12 Corridor are approximately 12 feet wide. Lane and shoulder widths are particularly important for goods movement by trucks, which require appropriate design standards to operate efficiently and safely on the State highway system. There are several areas where the shoulder widths do not meet design standards: for a two-lane highway the standard outside shoulder is eight feet; on a four-lane highway the standards are a five-foot inside and ten-foot outside shoulder. Near-term projects will improve most of the deficient shoulders, but the locations shown in Exhibit 2-1 will remain with substandard shoulders.

Exhibit 2-1: Non Standard Shoulder Widths

Location	Post Miles	Shoulder	Standard	Existing
Webster St to Marina Blvd	4.4 - 5.1	Inside / Outside	5’ / 10’	2-3’ / 4-8’
Walters Road to Shiloh/Lambie Roads	7.5 - 13.5	Inside	N/A [(a)]	0’
Liberty Island Road to Drouin Road	23.7 - 25.8	Outside	8’	0-6’ (mostly 2’ or less)
Rio Vista Bridge	26.3 (~3000’)	Outside	8’	0’
Mokelumne Bridge	6.1 (SAC) (~1500’)	Outside	8’	0-4’

Note:
1. The Caltrans Highway Design Manual does not have a standard for inside shoulders on two-lane highways, but no shoulder is considered below standards.

Three of the five locations with substandard shoulders are caused by bridge structures. As a major inter-regional freight and goods movement corridor, shoulder width is a critical geometric element at bridges and in areas of high truck volumes, including SR-12 Corridor segment near I-80.The Webster Street Overcrossing and Fairfield Overhead bridge structures have the narrow inside and outside shoulder and form the constraint in the Webster Street to Marina Boulevard section. A median concrete barrier was installed as part of the safety enhancement implementations between Walters Road and Shiloh/Lambie Roads. This section has full width standard outside shoulders, but there is no inside shoulder adjacent to the concrete barrier. Exhibit 2-4 graphically shows these locations. Upon completion of the near-term projects, a total 9.65 (3.65 outside, 6 inside) lane miles, or 22% of the total length of the SR-12 Corridor (I-80 to I-5) will have non-standard shoulders.

Median Treatments

Median treatments on SR-12 consist of median concrete barriers or guardrails, depressed medians, tubular channelizers, and rumble strips. Median channelizers and rumble strips are used in locations where passing is not permitted and there is a double yellow stripe. There will be two, two-lane sections that will have median concrete barrier: Walters Road to Shiloh/Lambie Road and Mokelumne Bridge to Potato Slough Bridge. Median concrete barriers are used on two-lane roadways to restrict passing and

eliminate head-on accidents. The use of the median concrete barriers, channelizers, and rumble strips is directly related to past accident trends and the severity of accidents.

Bicycle Facilities

The completion of the near-term projects identified in Section 1 will improve many of the areas where shoulders were less than four feet; however, there will still be a 2-mile stretch just west of Rio Vista that will be lacking adequate shoulder width for bicyclists. This stretch along with the Rio Vista and Mokelumne Bridges are the narrowest locations restricting bicycling in the corridor and likely causing bicyclists to ride in travel lanes when using SR-12 along this segment.

Sideslopes

Sideslopes with a slope of 4:1(horizontal: vertical) or flatter are both traversable and recoverable, 3:1 sideslopes are recoverable, and anything 2:1 or steeper is considered non-recoverable. There are several areas that have non-recoverable sideslopes as shown in Exhibit 2-4. Many of the locations are in the delta area where subsidence of adjacent soil and adjacent irrigation ditches create steep sideslopes. There are also a few locations not shown in Exhibit 2-4 in the Solano Urban segment where there are adjacent environmental resources.

Bridges

In addition to the three moveable bridges, there are nine other bridge structures consisting of overcrossing structures at local streets, railroads, and drainage crossings along the corridor. The three moveable bridges (See Exhibit 2-2) are the most significant bridges in terms of length and impact to traffic on SR-12. Bridges are routinely inspected to confirm structural capacity and identify maintenance needs. Structural deficiencies are characterized by deteriorated conditions of significant bridge elements and reduced load-carrying capacity. Structures can also be identified as functionally obsolete when the geometrics of a bridge do not meet current standards, usually related to shoulder widths. Neither structural deficiency nor functional obsolescence necessarily indicates that a bridge is unsafe. The condition of bridges is shown in Exhibit 2-3.

The Rio Vista Bridge crossing the Sacramento River was constructed in 1963 and has a clearance of 18 feet above ordinary high tide. Rio Vista is a lift bridge using counterweights to lift a 310-foot long section on the western half of the bridge. The total length of the bridge including approach structures is 2,890 feet. The bridge is operated 24 hours a day seven days a week and regularly opens for sailboats, tugboats, and large barges. The bridge is considered functionally obsolete because of the lack of shoulders and is also structurally deficient due to the need for repairs to several elements of the bridge.

The Mokelumne Bridge was constructed in 1942 and has a clearance of eight feet above ordinary high tide. This bridge is a center pivot swing drawbridge. The total length of the bridge including approach structures is 1,436 feet. The bridge is opened frequently, but is only staffed with an operator during extended daytime hours. Because of the low clearance, the bridge has to open for almost all vessels on the Mokelumne River. The most common vessels are recreational motorboats, sailboats, and house boats. The bridge is considered functionally obsolete because of the narrow shoulders.

Both the Mokelumne River Bridge and Rio Vista Bridge cross navigable waters, with the U.S. Coast Guard (USCG) as the controlling jurisdiction. The USCG has authority over construction activities, signals at bridges, and regulations that govern drawbridge operations. This authority is administered by the Eleventh Coast Guard District Bridge Section.

The Potato Slough Bridge was constructed in 1991 and has a typical high-tide clearance of 35 feet. This bridge is a center pivot swing drawbridge. The total length of the bridge including approach structures is 2,980 feet. The bridge is opened by appointment only. The higher clearance allows most boats to pass underneath without the need to open the bridge. The bridge is rated as structurally deficient due to the need for repairs to the bridge deck and adjacent elements.

Exhibit 2-2: SR-12 Corridor Drawbridges

Bridge	Year Built	Type	Typical High-Tide Clearance	Operation Schedule
Rio Vista Bridge	1963	Lift Bridge (Counterweights)	18'	24 hours/7 days
Mokelumne Bridge	1942	Swing Drawbridge (Pivot)	8'	May-Oct 6am-10pm Nov-Apr 9am-5pm 4 hours advance notice required
Potato Slough Bridge	1991	Swing Drawbridge (Pivot)	35' (Unimpaired)	On-call only (Opened 6 times in 2004) 4 hours advance notice required

The Chadbourne Road Undercrossing, Fairfield Overhead, and the Denverton Overhead bridges are noted as structurally deficient due to the need for need of repairs. As discussed previously in regard to cross section elements, the Webster Street Undercrossing and Fairfield Overhead Bridge have shoulders below current standards. These two bridges are considered functionally obsolete.

Exhibit 2-3: Bridge Condition

Bridge	Structurally Deficient	Functionally Obsolete
Rio Vista Bridge	▲	▲
Mokelumne Bridge		▲
Potato Slough Bridge	▲	
Chadbourne Road Undercrossing	▲	
Webster Street Undercrossing		▲
Fairfield Overhead Bridge	▲	▲
Denverton Overhead Bridge	▲	

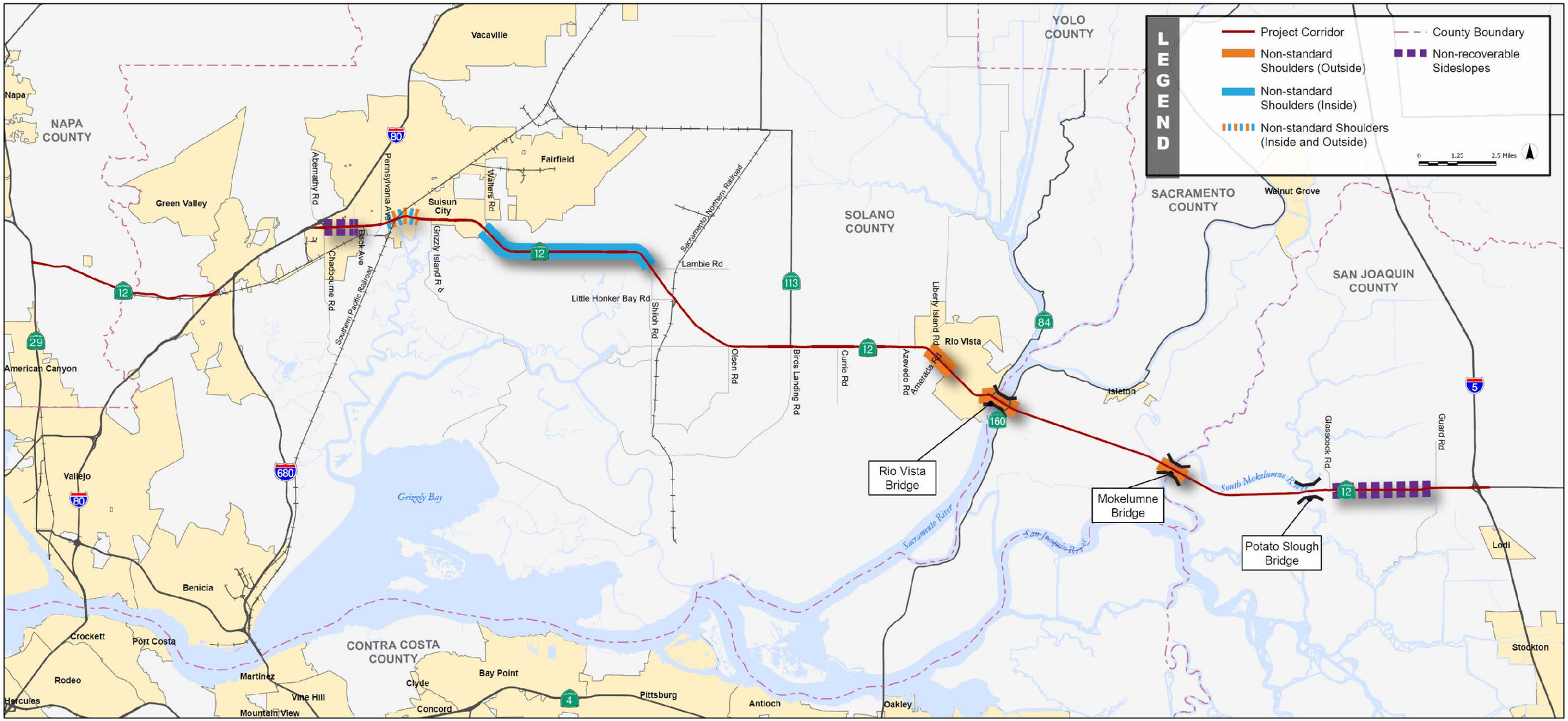
Summary of Section 2

This section presents a summary of an evaluation of the geometric conditions in the corridor, including identification of geometric deficiencies, issues with the existing physical conditions, and characterization of the three moveable bridges within the corridor. A summary of key issues addressed in this section include:

- *Geometric Deficiencies:* Upon completion of the current and planned projects, there will still be several areas that have geometric deficiencies, including non-standard inside and outside shoulder widths for 22% of the corridor, including the Rio Vista and Mokelumne Bridges.
- *Bicycle Facilities:* Upon completion of the current and planned highway projects, a 2-mile segment will remain west of Rio Vista with inadequate shoulder width causing bicyclists to ride in travel lanes of SR-12.
- *Bridge Condition:* All three drawbridges and four other bridges in the corridor are considered either structurally deficient or functionally obsolete; the Rio Vista Bridge is both. Neither structural deficiency nor functional obsolescence necessarily indicates that a bridge is unsafe.

These key issues will be evaluated during the development of the future conditions analysis to determine the impact of forecasted conditions and to identify improvement strategies to mitigate corridor safety, congestion, and operational issues along the corridor.

Exhibit 2-4: SR-12 Cross Section Deficiencies



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Section 3: Traffic Characteristics of the SR-12 Corridor

Traffic Characteristics

Traffic characteristics were evaluated at four representative locations along the SR-12 Corridor to assess daily variations in traffic volumes, or flow rates. Eight data locations (four eastbound and four westbound) were chosen for this analysis. Data locations were chosen to represent typical traffic characteristics for various segments of the SR-12 Corridor. The locations chosen were:

- Between Beck Avenue and Pennsylvania Avenue – 4-lane urban segment located in Solano County.
- Between Walters Road and Shiloh Road – 2-lane rural segment located in Solano County.
- Between SR-160 and Brannan Island Road – 2-lane rural segment located in Sacramento County.
- Between West Terminous Road and I-5 – 2- and 4-lane rural segment Located in San Joaquin County.

The source of the data used to evaluate daily volume variation was the Freeway Performance Measurement System (PeMS), which was developed jointly by Caltrans and the Partners for Advanced Transit and Highways (PATH) at the University of California, Berkeley. Only one PeMS data location was active in 2008 and data collected at this location was used to determine daily volume variation patterns on SR-12. Hourly traffic volume was obtained from counts conducted in the last week of May and the first week of June, 2010, and excluded the Memorial Day weekend days. AM counts were conducted from 5 am to 8 am and PM counts from 3 pm to 6 pm.

Daily Traffic Variation

The SR-12 Corridor serves both commuter and intercity travel markets. This corridor is a primary travel route providing home-to-work and work-to-home travel for residents living in the Napa, Solano, Sacramento and San Joaquin counties, and the primary route for those living in Rio Vista and other Delta communities along the corridor. In addition, the corridor also serves significant recreational and agriculture-related traffic. To determine the impact of commuter travel along this corridor, daily traffic volumes from the September 5, 2008 to September 15, 2008 time period were evaluated. Although 2010 volumes are lower due to the nationwide economic downturn, the daily pattern is not significantly different. Exhibit 3-1 illustrates variations in weekday traffic volumes by day of the week for the SR-12 segment near Scally Road near Suisun City. As shown in the exhibit, traffic volumes from Monday through Thursday are similar in intensity indicating primarily commuter traffic. Review of daily volume data for summer months and other locations of the corridor indicated trends very similar to those shown in Exhibit 3-1. Volume charts for summer months and other locations are included in Appendix A. The corridor experiences the highest volumes on Fridays due to a combination of commuter and recreation-related traffic. Daily truck and general traffic volumes are shown on Exhibit 3-2.

Adjustment to Traffic Count Data

The traffic count data collected in May 2010 was compared to historic traffic data to determine if adjustments should be made to reflect seasonal variation or impacts of recession period economic conditions.

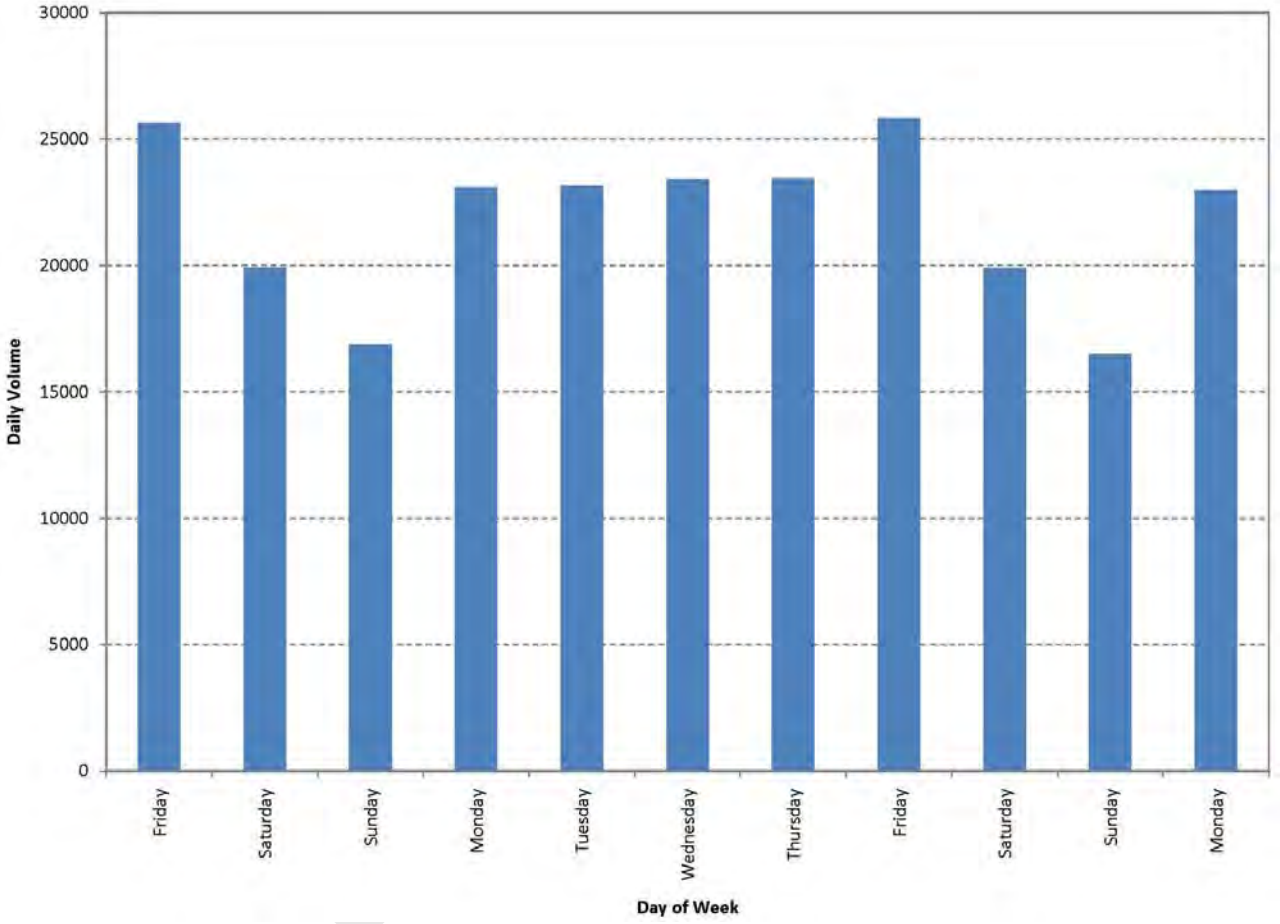
Seasonal Traffic Variations

Seasonal variation in traffic volumes was considered to place in perspective the traffic counts performed during May 2010. (See Appendix C for graphs of data.) Caltrans seasonal traffic data were not available for every month except at the very eastern end of the corridor. Based on the Caltrans data, May traffic volumes are typically lower than those during the peak months of June and July, but where data are available to compare month by month, the May traffic is lower by less than 10%. Consequently, we conclude that no seasonal correction is needed for the forecasts.

2010 Counts Adjusted for Economic Conditions

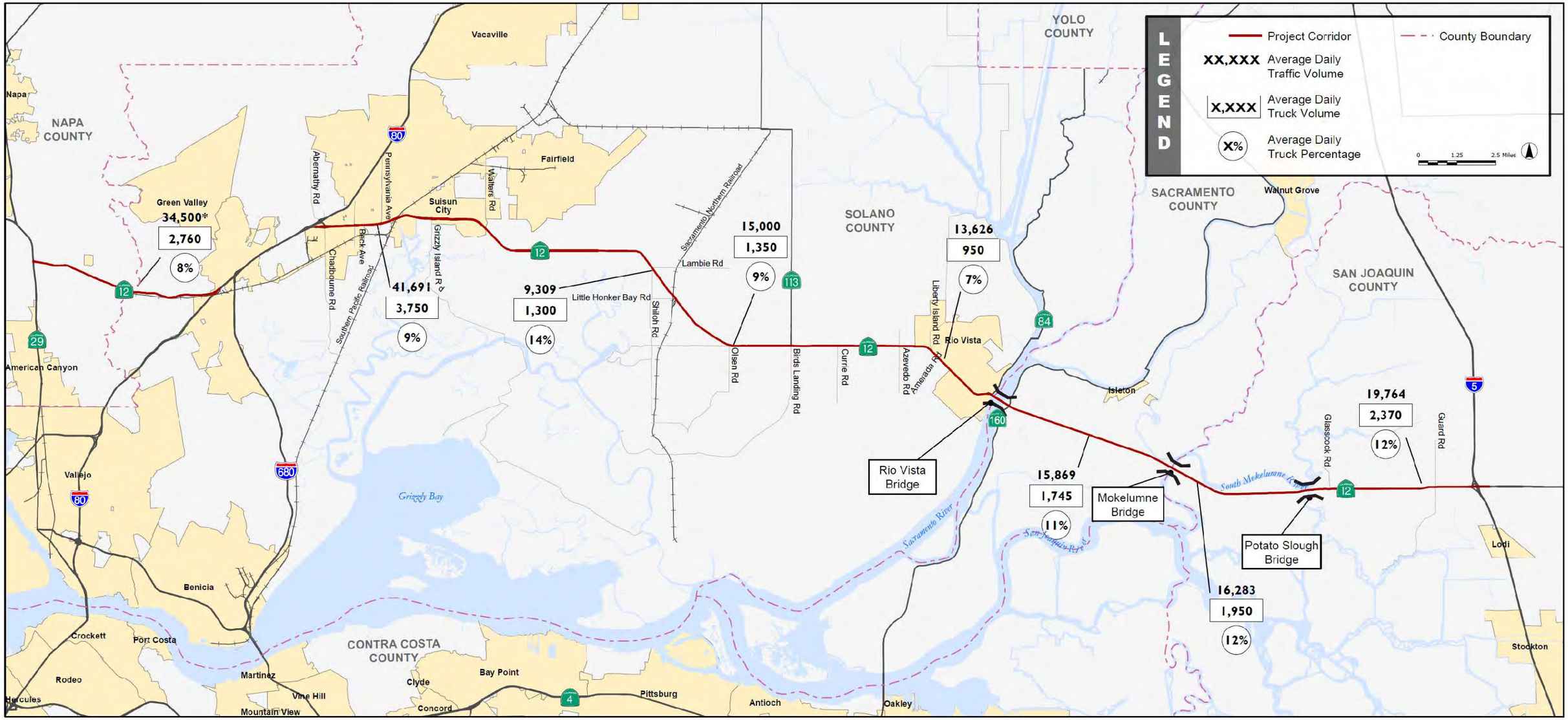
To address concerns that the recent recession had depressed traffic volumes in the corridor below what could be considered a reasonable basis for the 2035 forecasts, this study analyzed the magnitude of this effect and adjusted the 2010 counts accordingly. We reviewed Caltrans AADT for SR-12 from 2000 through 2009 and found that corridor average AADT in 2009 was 8% lower than during 2005 through 2007, but some locations in Fairfield and Rio Vista were 20% lower. To give a more reasonable basis for a long-range forecast, the 2010 counts were adjusted link by link corresponding to the AADT changes to reflect the 2005 through 2007 period rather than the 2009 conditions. Because a few links in eastern Fairfield had AADT that increased between 2005-2007 and 2009, these links were not adjusted.

Exhibit 3-1: Daily Variations in Traffic Volumes
(Scally Road) September 5, 2008 – September 15, 2008



Source: PBS&J Traffic Analysis, 2010.

Exhibit 3-2: Average Truck Volumes on SR-12



Source: PBS&J Traffic Analysis, 2010.

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Exhibit 3-3 lists average daily traffic (ADT) volumes at select locations on the corridor. Detailed link and turning movement volumes are shown in figures included in Appendix B. As indicated, the ADT volumes along the SR-12 Corridor range from approximately 42,000 in the vicinity of I-80 to 20,000 in the vicinity of I-5. SR-12 experiences lower on segments east of Walters Road and west of Brannan Island Road.

Exhibit 3-3: SR-12 2010 Corridor Average Daily Traffic Volumes

Location	Average Daily Traffic[1]
Jameson Canyon	34,500[2]
Between Beck Ave and Pennsylvania Ave	41,691
Between Walters Road & Shiloh Road	9,309
Between Summerset Drive and Main St	13,626
Between Brannan Island Road and W. Terminous Road	16,283
Between W. Terminous Road & I-5 SB Ramps	19,764

Notes:
1 Data from PBS&J traffic analysis, 2010 except as noted.
2 2005 data from Operational Analysis for the SR-12 Widening Project and Route 12/29 Interchange

Hourly Traffic Volumes

Exhibit 3-4 through Exhibit 3-7 presents a summary of eastbound and westbound weekday (Tuesday, Wednesday, and Thursday) traffic volumes averaged for the May 25, 2010 to June 2, 2010 analysis period (excluding Memorial Day weekend) at representative locations along SR-12 between:

- Beck Avenue and Pennsylvania Avenue;
- Walters Road and Shiloh Road;
- SR-160 and Brannan Island Road; and
- W. Terminous Road and I-5.

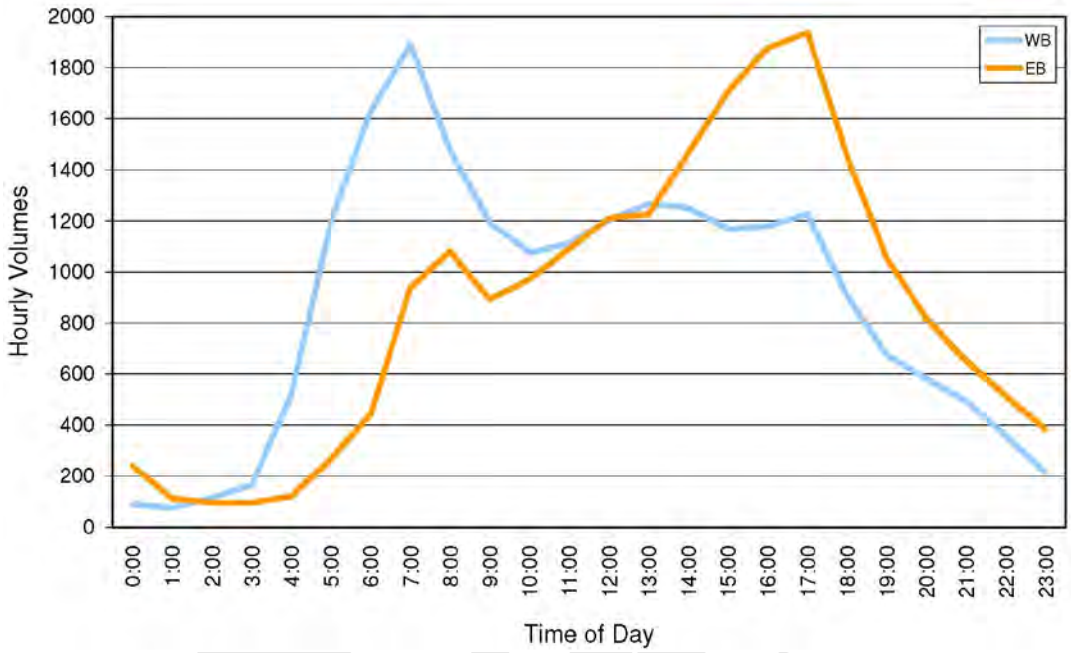
Between Beck and Pennsylvania Avenue: The hourly profiles for weekday traffic for SR-12 between Beck Avenue and Pennsylvania Avenue are representative of hourly distributions typical of a corridor that serves local, commute, and longer-distance intercity travel. More specifically, these profiles show a concentrated morning peak in the westbound direction, and an evening peak in the eastbound direction, while demand during the midday is moderate. The traffic data indicates a commuter pattern heading towards I-80 in the morning and in the opposite direction in the evening. Exhibit 3-4 shows the daily volume profile for SR-12 between Beck Avenue and Pennsylvania Avenue in Solano County.

Between Walters Road and Shiloh Road: SR-12 is a two-lane roadway east of Walter Road and experiences lower volumes as compared to the four-lane segment. The eastbound and westbound peaks during the PM and AM peak hours are similar in magnitude. This segment of SR-12 serves approximately 700 vehicles during the peak hour at this location. Exhibit 3-5 shows the daily volume profile for SR-12 between Walters Road and Shiloh Road in Solano County.

Between SR-160 and Brannan Island Road: Exhibit 3-6 shows the daily volume profile for SR-12 between SR-160 and Brannan Island Road in Sacramento County. SR-12 is a two-lane roadway at this location and functions with a less pronounced peak and serves approximately 1,300 vehicles during the peak hour at this location. The peak PM volume is more pronounced that the AM peak volume.

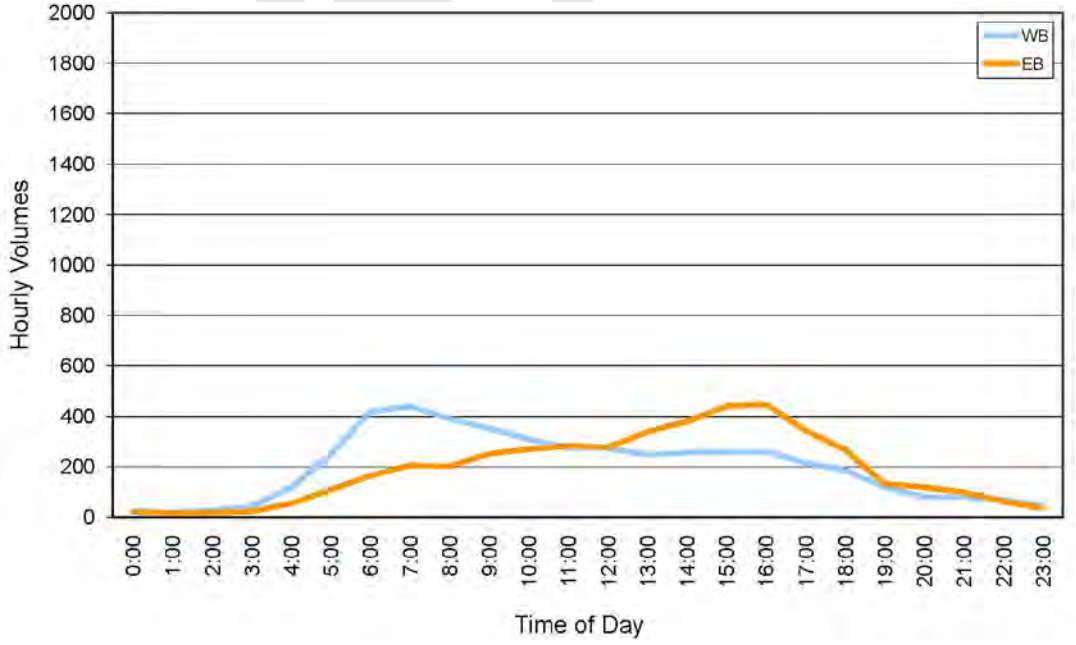
Between W. Terminous Road and I-5: Exhibit 3-7 shows the daily volume profile for SR-12 between W. Terminous Road and I-5 in San Joaquin County. SR-12 is a two-lane roadway at this location and experiences volumes that are higher than those in Sacramento County. The eastbound peak for PM period is slightly higher than that for the westbound AM peak. This segment of SR-12 functions with a less pronounced peak and serves approximately 1,500 vehicles during the peak hour at this location.

Exhibit 3-4: Weekday Hourly Traffic Volumes between Beck and Pennsylvania Avenue



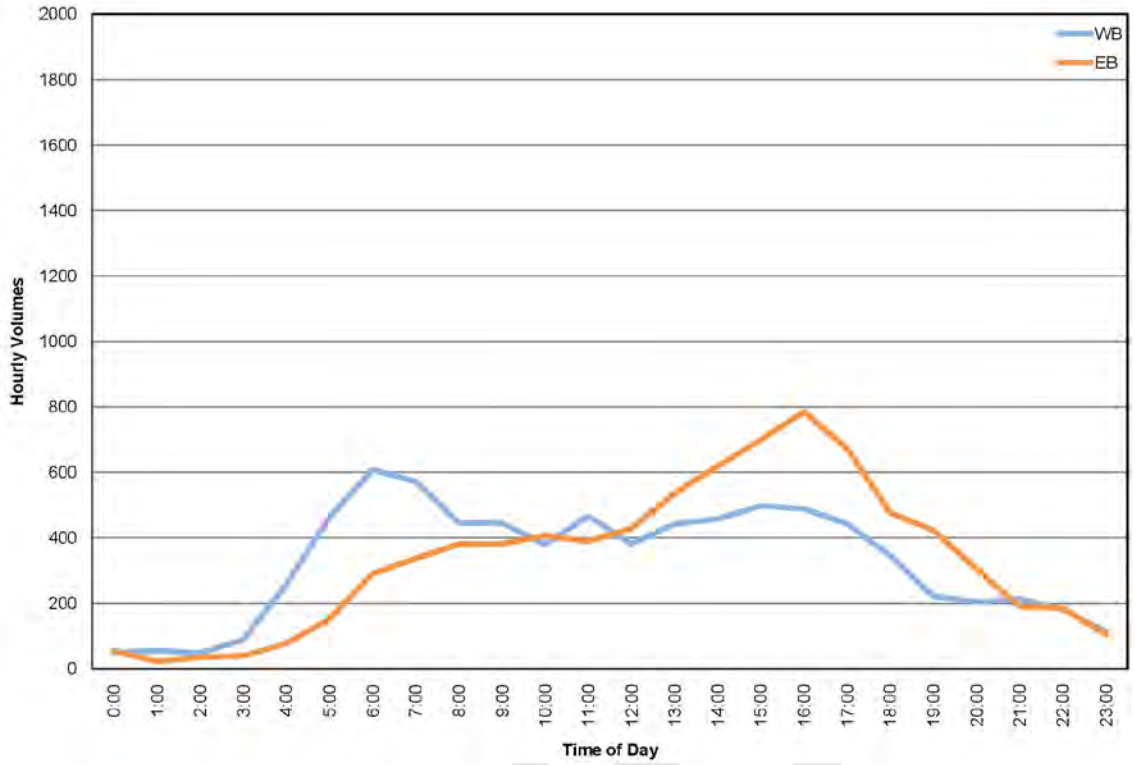
Source: PBS&J traffic analysis, 2010.

Exhibit 3-5: Weekday Hourly Traffic Volumes between Walters Road and Shiloh Road



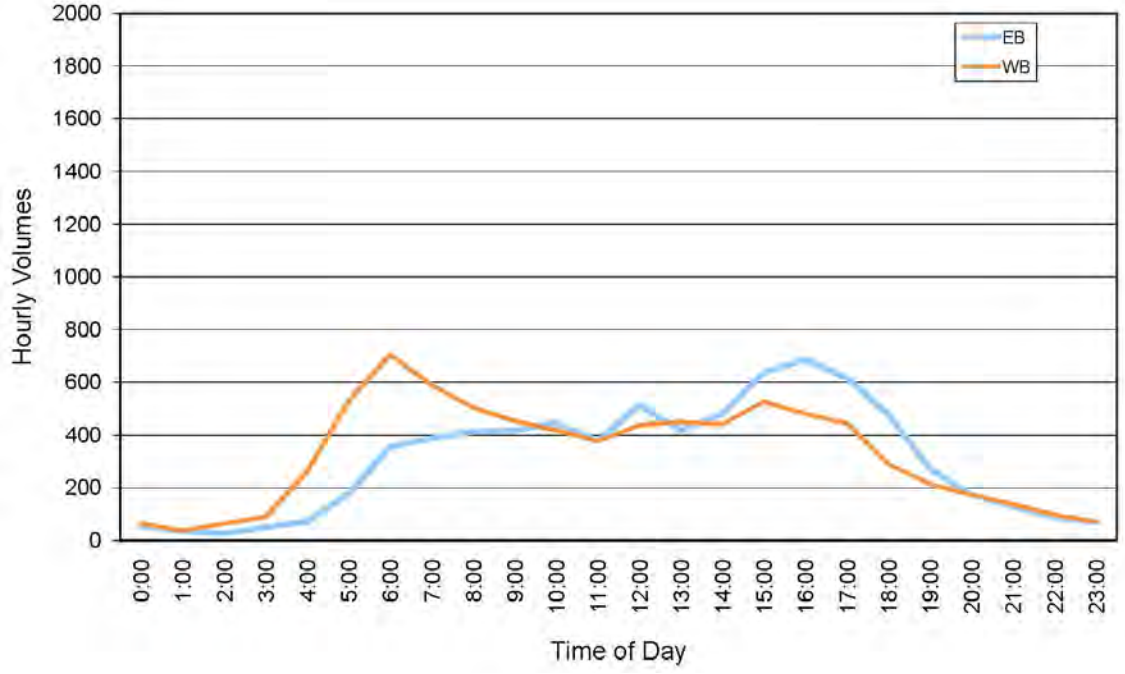
Source: PBS&J traffic analysis, 2010.

Exhibit 3-6: Weekday Hourly Traffic Volumes between SR-160 and Brannan Island Road



Source: PBS&J traffic analysis, 2010.

Exhibit 3-7: Weekday Hourly Traffic Volumes between W. Terminous Road and Interstate 5



Source: PBS&J traffic analysis, 2010.

Truck and Heavy Vehicle Traffic

SR-12 is a significant corridor for goods movement between the San Joaquin Valley and Solano and Napa Counties, and it provides a critical link between I-80, a major route for interstate commerce, and I-5. Agricultural goods are transported on SR-12 to Napa County and beyond from the San Joaquin Valley and Delta area. SR-12 is also a Department of Defense truck route and part of the federal Surface Transportation Assistance Act (STAA) with a designation as a terminal access route. SR-12 provides the most direct route for high priority shipments between the Department of Defense Logistics Agency Distribution Center in Tracy, CA and the Travis Air Force Base. Travis AFB is one of the two largest US Air Force cargo terminals in the continental United States. The South Gate of Travis AFB, which handles all explosive and hazardous cargos, is located just off of SR-12 in eastern Suisun City. Use of SR-12 to move cargos to the South Gate avoids the use of alternative roadways such as I-80 and I-580, which pass through more densely populated areas such as downtown Sacramento. The terminal access route designation means that SR-12 can accommodate the federal truck standard. Truck and heavy vehicle traffic makes up seven to fourteen percent of daily vehicle trips along the SR-12 Corridor. Exhibit 3-8 lists the truck percentage values and actual average daily truck values for various SR-12 segments.

Exhibit 3-8: SR-12 2010 Corridor Average Truck Traffic Volumes and Percentages

Location	Average Daily Truck Percentage	Average Daily Truck Traffic[1]
Between SR-29 and Red Top Road (Jameson Canyon)	8%	2,760[2]
Between Beck Ave and Pennsylvania Ave	9%	3,750
Between Walters Road & Shiloh Road	14%	1,300
Between Summerset Drive and Main St	7%	950
Between Brannan Island Road and W. Terminous Road	12%	1,950
Between W. Terminous Road & I-5 SB Ramps	12%	2,370

Notes:
1 Data from PBS&J traffic analysis, 2010 except as noted.
2 2005 data from Operational Analysis for the SR-12 Widening Project and Route 12/29 Interchange

No specific origin or destination studies were completed; however, review of available data, field observations, and discussions with local maintenance and chamber staff provided a general understanding on heavy vehicle traffic patterns. Truck and heavy vehicle traffic includes pass-through traffic, trips with only an origin or destination on the corridor, and trips with both an origin and destination within the corridor. Agricultural goods originate in the rural Solano and Delta areas and are transported out of the study area. Agricultural goods vehicles that pass through the study area transport goods from the San Joaquin and Central Valleys to Napa and Sonoma Counties. There are a high number of industrial facilities in the City of Fairfield between I-80 and Grizzly Island Road that generate truck trips from I-80 and along SR-12. The Portrero Hills Landfill, accessed from Scally Road, is the destination for waste hauling trucks. Travis Air Force Base receives military goods from both the east and west along SR-12 and the truck entrance is the south entrance accessed from the SR-12 and Walters Road intersection. Travis Air Force Base has plans to expand the south entrance to add additional truck lanes and reconfigure the access.

Recreational Vehicle Traffic

The Delta region has more than 55 major islands and close to 1,000 miles of navigable waterways. The Delta is a popular recreational destination for many purposes, the most popular being boating. There are over 100 marinas and waterside resorts in the Delta. SR-12 is the primary east-west highway in the middle of the delta region. It provides access to some of the larger marinas and popular boating docks between Rio Vista and the Potato Slough Bridge. Access to these marinas and docks is made primarily from the intersections of SR-12 with SR-84, SR-160, Jackson Slough Road, W. Terminous Road, and Brannan Island Road. Recreation traffic generally consists of three-axle vehicles representing a truck and boat trailer. While not all 3-axle vehicles represent recreational vehicle traffic, we considered all 3-axle vehicles as recreational vehicles for the purposes of this

study to provide an indication of the volume of recreational vehicle traffic, recognizing that doing so may present a somewhat inflated view of such traffic. Exhibit 3-9 presents average daily weekday 3-axle vehicle traffic as an approximation of recreational vehicle traffic.

Exhibit 3-9: SR-12 Corridor 2010 Average 3-Axle Vehicle Traffic Volumes and Percentages

Location	Average Daily (Weekday) 3-axle Vehicle Traffic[1]	
Between Beck Ave and Pennsylvania Ave	1.4%	587
Between Walters Road & Shiloh Road	8.7%	812
Between Summerset Drive and Main St	5.3%	732
Between Brannan Island Road and W. Terminous Road	1.8%	305
Between W. Terminous Road & I-5 SB Ramps	2.6%	520

Note:
1 percentage of total average daily vehicles
Source: PBS&J traffic analysis, 2010.

Agricultural Vehicle Traffic

The economy of the study area has traditionally relied on agricultural production. Agricultural vehicle traffic occurs both along the mainline in segments of the corridor as well as crossing of the highway. Crossing of agricultural vehicles has been a significant issue on segments of the SR-12 Corridor and has required special considerations to safely manage these crossings. At this time, no data on the volume of agricultural vehicle traffic is available; however, the need for agricultural vehicle crossings must be considered when developing mitigation strategies for the corridor.

Summary of Section 3

This section presents a summary of an evaluation of existing traffic data along the corridor with respect to seasonal, weekly and hourly variation. This evaluation establishes key analysis periods for the corridor and presents information on truck and heavy vehicle, recreational vehicle, and agricultural traffic use in the corridor. Further, it examines frequency of bridge openings and impact on traffic congestion. A summary of key issues addressed in this section include:

- *Vehicle Traffic:* 2010 Average Daily Traffic (ADT) volumes along the SR-12 Corridor range from approximately 42,000 in the vicinity of I-80 to 20,000 in the vicinity of I-5. SR-12 experiences lower ADTs (10,000 to 15,000) on segments east of Walters Road and west of Brannan Island Road. Traffic count data from May 2010 should be adjusted to account for lowered volumes due to economic recession when used for predicting future traffic volumes.
- *Truck Traffic:* Truck and heavy vehicle traffic makes up seven to fourteen percent of daily vehicle trips along the SR-12 Corridor.
- *Recreational Traffic:* The Delta region is a popular recreational destination and recreational vehicle traffic is estimated to be from 2 to 8% of all daily vehicles. Recreational vehicle traffic was observed to be highest during weekends.
- *Agricultural Traffic:* Agricultural vehicle traffic is common both on the mainline and at crossings. Accommodations for agricultural vehicle crossings need to be considered in mitigation strategies.

These key issues will be evaluated during the development of the future conditions analysis to determine the impact of forecasted conditions and to identify improvement strategies to mitigate corridor safety, congestion, and operational issues along the corridor.

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Section 4: SR-12 Corridor Performance Evaluation

The existing corridor performance evaluation relies heavily upon the use of available collected data and field observations. This section includes a discussion of the methods and tools used to identify congestion and present an analysis of existing conditions with a focus on identifying congested areas, bottlenecks and the causes of these delays. Operational performance of the corridor is quantified using travel times, operating speeds and intersection delay. An evaluation of travel time, speed and delay helps quantify mobility along the corridor. A comparative analysis of the travel times provides an estimate of travel time predictability along the corridor. An evaluation of accidents and accident rates for segments of the corridor was also conducted to evaluate safety along the corridor.

Analysis Methodology

The analysis periods and traffic data inputs for the SR-12 Corridor performance evaluation are documented in Section 3 of this document. The methodology used for the evaluation began with a review of existing data sources for the corridor including PeMS data and travel time runs conducted for this study. PeMS data was found to be scant on this corridor – only one PeMS location was active in 2008. Hence, most of the analysis is based on data collection conducted for this study and data from analysis tools (SYNCHRO and CORSIM).

Travel time runs used in the analysis were conducted in segments, during morning and evening peak periods on weekdays, and during the months of May and June in 2010. The analysis methods were designed to address mobility, travel times, reliability and safety in the corridor. The PeMS data and tach run data along with analysis tools were used to evaluate speeds, bottlenecks and congestion in the corridor, as well as to generate overall performance measures such as delay, speeds and travel times. Caltrans accident and incident data by corridor segment are used to assess safety and to calculate segment accident rates.

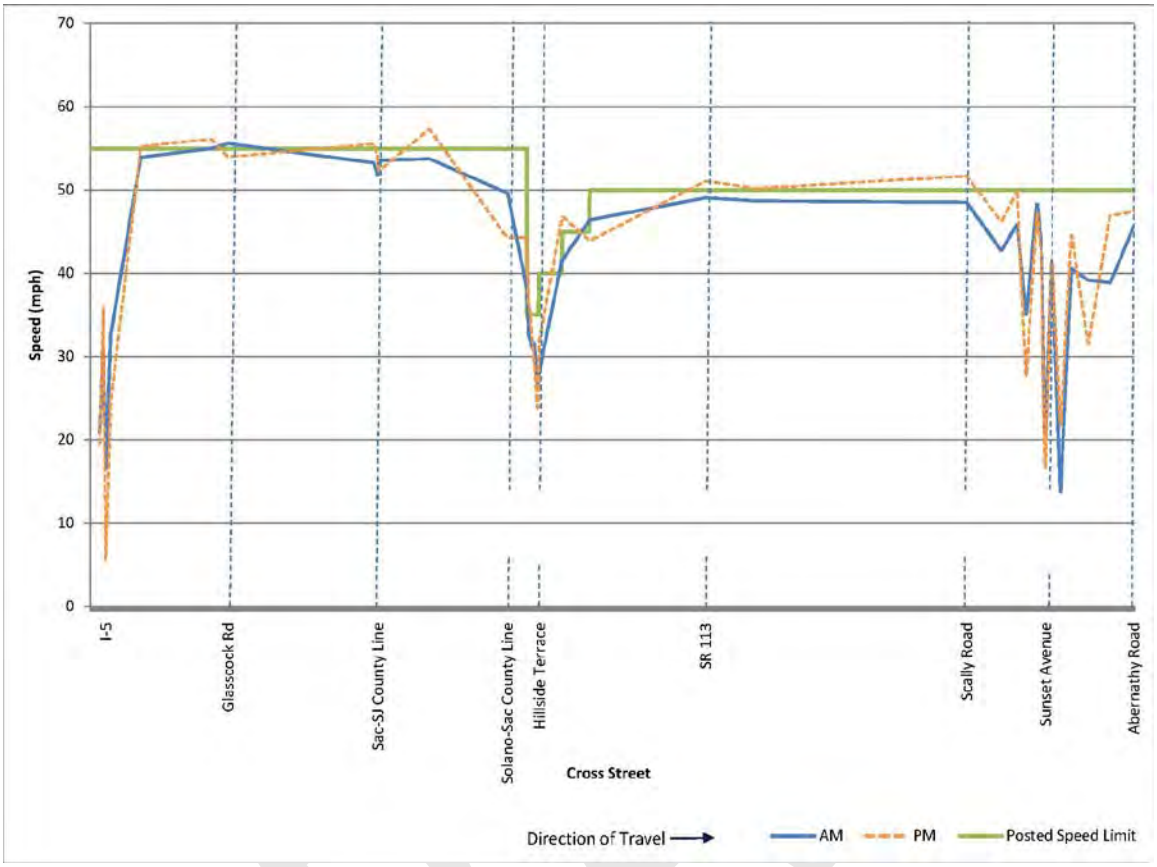
Mobility in the SR-12 Corridor

The primary measures of mobility are travel time, speed, and delay. As stated previously, this study defines recurrent delay due to congestion as vehicle operating at Level of Service (LOS) D, E or F. Level of Service is a measure of performance commonly used to define variations in traffic flow at intersections and on mainline roadways. It is defined in the Highway Capacity Manual (HCM) prepared by the Transportation Research Board, and described further on pages 4-6 and 4-8 of this Section. Generally, LOS relates traffic volume to roadway capacity. It is calculated differently for intersections than for mainline roadway segments and for different classifications of roadways, rural highways, and urban streets, but generally LOS is a function of vehicle delay and travel speed. To identify bottlenecks and congested areas, travel time runs for the analysis period are plotted for the average weekday. Locations with significant delays were identified by evaluating the analysis data from analysis models, travel time data, traffic demand counts and field observations.

Westbound SR-12 Travel Times

Exhibit 4-1 illustrates the speed profile in the westbound direction of travel. The coverage shown in the exhibit is from I-80 (Abernathy Road) in the west to I-5 in the east. Review of the travel time data indicates the presence of low average speeds on the west end of the corridor between I-80 and Walters Road through Suisun City. Lower speeds are observed on segments that carry the highest corridor volumes between Abernathy Road and Walters Road. Slower speeds were also observed in the vicinity of Rio Vista and near the I-5 interchange which can be attributed to the presence of a signal and closely spaced intersections. The observed lower speeds in other areas can be attributed to control delay due to signals at intersections. No significant congestion was observed on segments of SR-12 with uninterrupted flow (from Sunset Avenue to Hillside Terrace and from River Road to I-5). This conclusion is also supported by the intersection analysis reports obtained from the analysis models.

Exhibit 4-1: Travel Time Variation – SR-12 Westbound



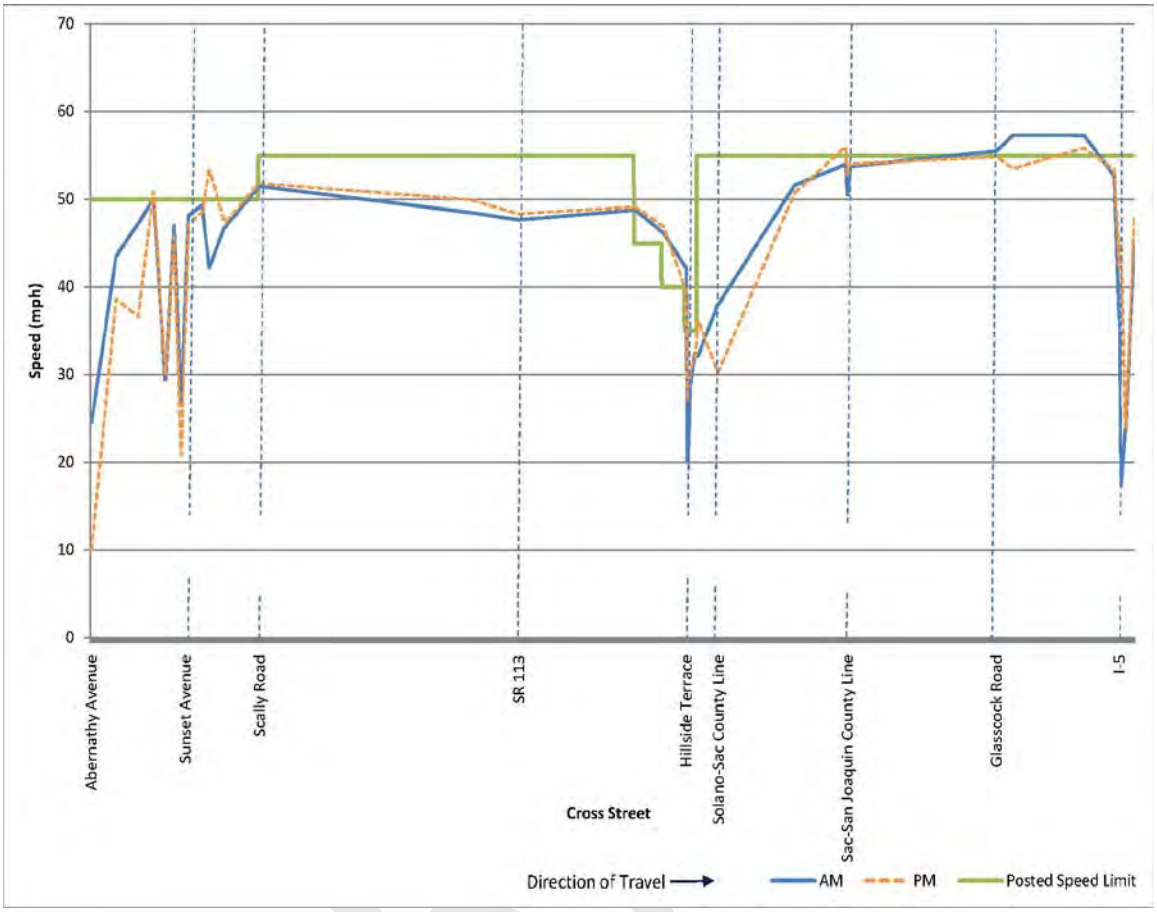
Source: PBS&J traffic analysis, 2010.

Eastbound SR-12 Travel Times

Exhibit 4-2 shows speed profiles for SR-12 in the eastbound direction of travel. As shown In Exhibit 4-2, the location of congested segments observed in the eastbound direction is similar to those observed in the westbound direction. Specifically, slower speeds are observed from the SR-12 and I-80 Interchange to Pennsylvania Avenue. Most of this congestion can be attributed to signal delay and significant side-street demand. Congestion is reflected in the intersection delay analysis performed using SYNCHRO software.

Because historical travel time data is unavailable for the SR-12 Corridor, a comparative analysis that examines variations in travel times during the peak hour was performed. Exhibit 4-4 and Exhibit 4-5 show the lowest, highest and average travel speeds for the corridor in the peak flow directions - westbound in the AM and eastbound in the PM peak hour. As shown in Exhibit 4-4 and Exhibit 4-5, travel speeds along the corridor did not show a consistent significant variation on the urban stretches of the corridor. Speeds on uninterrupted segments showed some variation throughout the peak hour. The difference between the highest and lowest speeds was approximately 10 mph in the westbound direction. Travel speeds in the eastbound direction were more uniform between different travel time runs; the highest variation in travel speed was observed for the segment between Scally Road and SR-113.

Exhibit 4-2: Travel Time Variation – SR-12 Eastbound



Source: PBS&J traffic analysis, 2010.

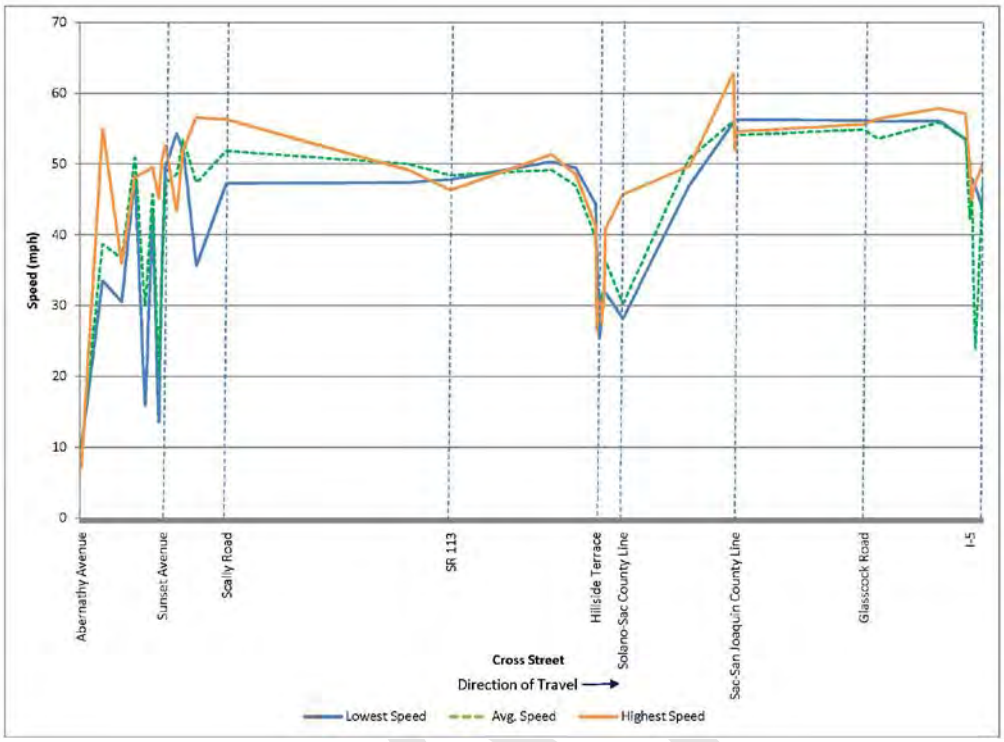
Exhibit 4-3 summarizes the average time it takes to travel the entire segment of the corridor from I-80 to I-5, a distance of approximately 42 miles. This exhibit also shows the shortest and longest observed travel times. Significant platooning caused primarily by heavy vehicles due to the absence of passing lanes was observed during field visits. Variations in travel time are more pronounced on 2-lane segments which indicate that platooning of vehicles maybe a contributing factor to slower travel speeds.

Exhibit 4-3: Travel Time Variability for the SR-12 Corridor

Section	Direction	Corridor Travel Times[1]		
		Shortest Travel Time	Average Conditions	Longest Travel Time
Between I-80 and I-5	Eastbound (PM)	49 mins 51 secs	52 mins 31 secs	54 mins 56 secs
	Westbound (AM)	49 mins 59 secs	53 mins 26 secs	57 mins 2 secs

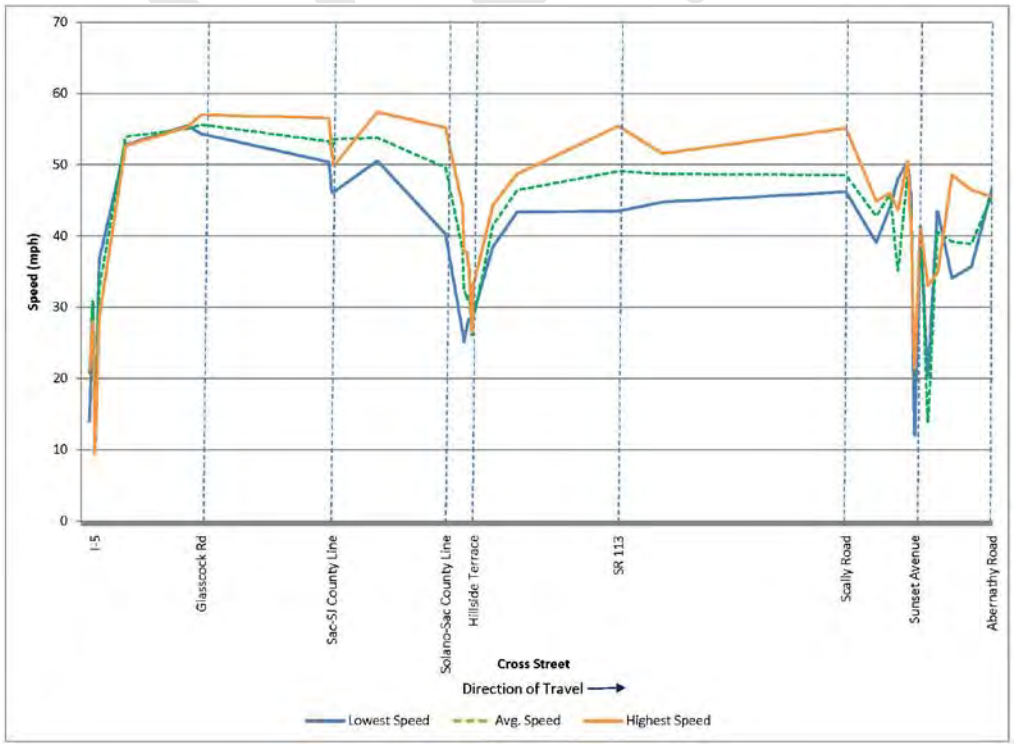
Notes:
1 Travel times do not reflect bridge opening delays.
Source: PBS&J traffic analysis, 2010.

Exhibit 4-4: SR-12 Corridor Speed Contour Variation in the Eastbound Direction during the PM Peak Period



Source: PBS&J traffic analysis, 2010.

Exhibit 4-5: SR-12 Corridor Speed Contour Variation in the Westbound Direction during the AM Peak Period



Source: PBS&J traffic analysis, 2010.

Impact of Moveable Bridge Openings on Traffic

The segment of SR-12 between River Road in Solano County and West Terminous Road in San Joaquin County traverses two moveable bridges; the Rio Vista Bridge and the Mokelumne Bridge. According to Caltrans District 4 Maintenance personnel, the Mokelumne Bridge is one of the most frequently opened bridges in the state. Due to maritime laws that give right-of-way priority to marine traffic, the Mokelumne and Rio Vista Bridges open frequently and at various times of the day depending on marine vessel arrivals and without regard to SR-12 traffic volumes. Exhibit 4-6 shows the monthly bridge openings along with the openings that occur during the PM peak periods of 4-6 pm for the Rio Vista and Mokelumne Bridges. The Potato Slough Bridge is opened by appointment only with estimates of less than ten total openings per year. The bridge openings typically last between 8 and 25 minutes depending on the type and number of vessels and cause significant traffic queues.

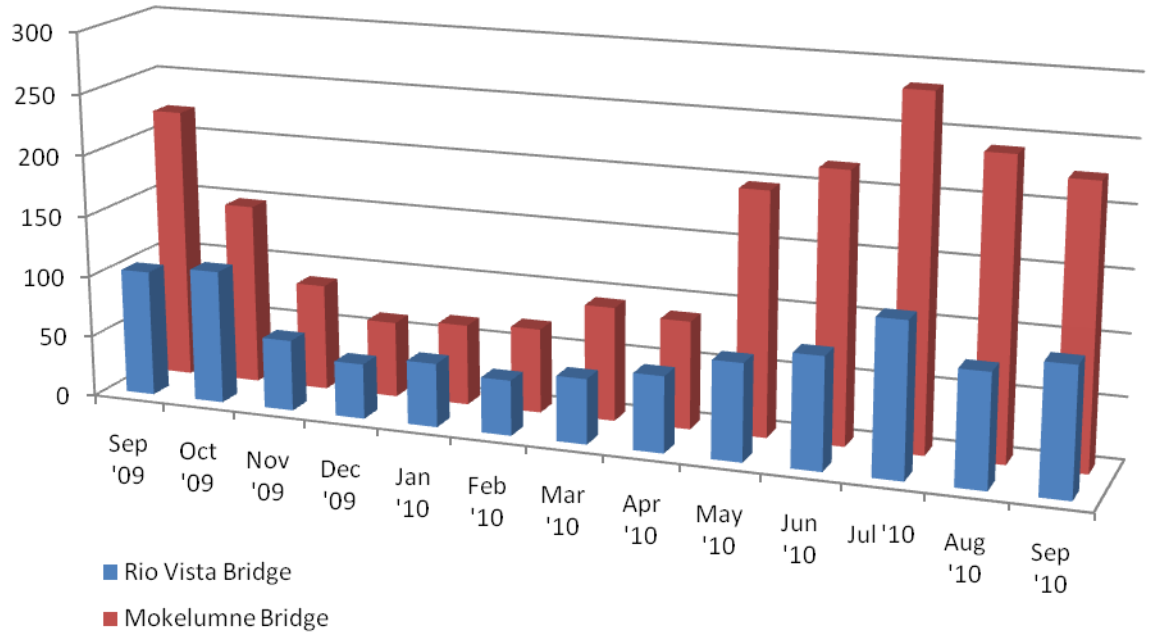
For the one year period of October 2009 through September 2010, the Mokelumne Bridge was opened nearly 1,800 times and the Rio Vista Bridge was opened over 900 times. Depending on the number and types of vessels that pass through the bridge, the average opening can last between three and fifteen minutes at Mokelumne and between five and twenty minutes at Rio Vista. As shown in Exhibit 4-6, there were as many as 36 openings per month of the Mokelumne Bridge during the PM peak hour and as many as 16 per month at the Rio Vista Bridge, which averages to around one each day and one every other day respectively per PM peak hour.

The Delta region has abundant recreation opportunities, particularly related to boating activities. The large number of recreational boats in the Delta combined with the low clearance of the Mokelumne and Rio Vista Bridges requires frequent openings during the summer months, as shown in Exhibit 4-7. Bridge openings from May to September are nearly twice and nearly three times more frequent than other months for the Rio Vista and Mokelumne Bridges, respectively.

Exhibit 4-6: Bridge Opening Data for Rio Vista and Mokelumne Bridges

	Rio Vista Bridge				Mokelumne Bridge			
Month	# of Openings	# of Vessels	# of Openings 4-6pm	% of Openings 4-6pm	# of Openings	# of Vessels	# of Openings 4-6pm	% of Openings 4-6pm
2009								
September	103	150	10	9.7%	222	350	28	12.6%
October	109	134	10	9.2%	148	195	18	12.2%
November	58	70	5	8.6%	87	114	6	6.9%
December	45	73	6	13.3%	62	74	5	8.1%
2010								
January	52	67	3	5.8%	66	98	6	9.1%
February	45	56	4	8.9%	69	105	12	17.4%
March	53	66	6	11.3%	93	133	11	11.8%
April	62	82	13	21.0%	88	121	10	11.4%
May	79	101	5	6.3%	198	394	25	12.6%
June	91	114	8	8.8%	219	360	31	14.2%
July	125	146	16	12.8%	284	457	36	12.7%
August	92	144	9	9.8%	241	369	38	15.8%
September	104	134	14	13.5%	226	323	29	12.8%
Source: Caltrans District 4 – Division of Maintenance, 2010.								

Exhibit 4-7: Monthly Bridge Openings for Rio Vista and Mokelumne Bridges



Source: Caltrans District 4 – Division of Maintenance, 2010.

A review of available data from previous studies indicates the number of openings of the Rio Vista and Mokelumne Bridges were substantially lower in 2009 and 2010 than past years, largely due to economic conditions. With the downturn in the economy over the last several years, recreational boating within the Delta has decreased. Additionally, the Rio Vista Bridge study noted that the Port of West Sacramento currently receives approximately 45 ships per year, but is permitted to receive as many as 120. In the past they have received as many as 110 per year. A comparison of available bridge opening data shown in Exhibit 4-8 indicates overall bridge openings for the same months were much higher in 2004 than 2009 and 2010. There were nearly twice as many openings of the Rio Vista Bridge, and between 1.5 and 2 times as many openings of the Mokelumne Bridge, in 2004 compared to 2009 and 2010 for both a summer and fall month. Recreational boating can be expected to recover with improved economic conditions. Port of West Sacramento shipping is also expected to increase due both to improved economic conditions bringing more ships into the facility and the Port's planned channel-deepening project. Further, planned development of a Marine Highway Corridor to the Ports of West Sacramento, Oakland, and Stockton may impact SR-12 by decreasing the number of freight and goods trips, but potentially increasing the number of bridge openings.

Exhibit 4-8: Comparative Bridge Opening Data 2004 to 2010

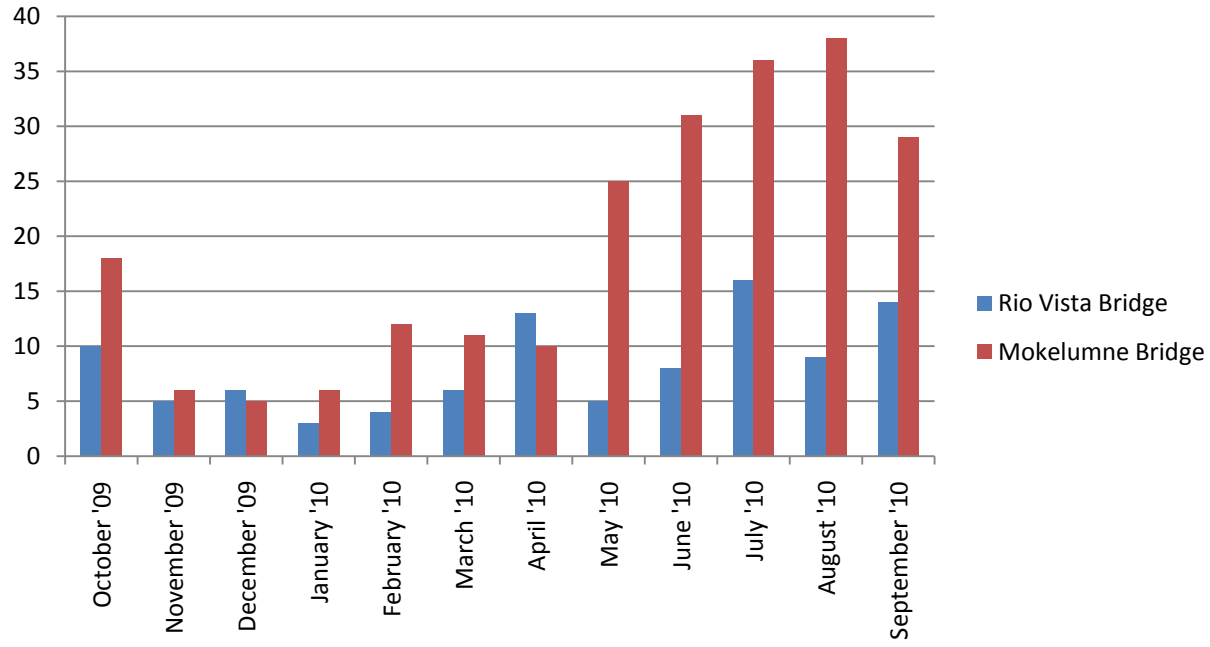
Bridge	June 2004	June 2010	September 2004	September 2009	September 2010
Rio Vista Bridge	205	91	190	103	104
Mokelumne Bridge	420	219	350	222	226
Source: Caltrans District 4 – Division of Maintenance, 2010.					

In summary, operation of the Rio Vista and Mokelumne Bridges has significant traffic impacts to the SR-12 Corridor, particularly during summer months. Based on review of data and discussions with Caltrans District 4 Maintenance personnel, bridge openings can create as much as 30 minutes of delay and create vehicle queues in excess of 200 vehicles in the peak direction.

PM Peak Openings

Openings of the bridges have the most significant impact when they occur during the PM peak hours of 4:00 to 6:00 PM. Based on data from the bridge openings log for the 12-month period between October 2009 and September 2010, as shown in Exhibit 4-9, the percentage of all openings of the Rio Vista Bridge and Mokelumne Bridge that are during the PM peak hours are 11% and 13%, respectively. As shown in Exhibit 4-9, from the data for the period between October 2009 and September 2010, there is some month-to-month variability in the number of all openings that occur in the PM peak hours. There is a pronounced seasonality of the PM peak hours openings during the summer months for the Mokelumne Bridge, and slightly less so for the Rio Vista Bridge.

Exhibit 4-9: Bridge Openings that Occur During the PM Peak Hour



Source: Caltrans District 4 – Division of Maintenance, 2010.Vehicle Queues.

Vehicle Queues

Field visits were conducted in September 2010 to survey the bridge openings and the resultant vehicle queues on SR-12. Field observations were limited to one opening of the Rio Vista Bridge and two openings of the Mokelumne Bridge. Field observations indicated that each five minute bridge opening resulted in a vehicle queue of approximately 70 vehicles for the Rio Vista Bridge and 74 to 80 vehicles for the Mokelumne Bridge during a mid-day, non-peak hour on a weekday.

As stated above, bridge opening durations vary from as few as eight minutes to as long as 25 minutes. To provide a range of the impact of opening times on vehicle queuing, we selected 10- and 20-minute opening durations to examine the vehicle queues that would be expected. A traffic analysis was performed to forecast the number of vehicles that would be delayed in each direction during the AM and PM peak hours at each bridge under both a 10- and 20-minute opening, and is summarized in Exhibit 4-10.

Exhibit 4-10: Projected Queues Due to 20-minute Bridge Openings

Bridge	Peak Hour	Queues (vehicles)			
		10-minute Bridge Openings		20-minute Bridge Openings	
		EB	WB	EB	WB
Rio Vista	AM	92	173	136	258
	PM	104	174	141	224
Mokelumne	AM	95	135	116	155
	PM	137	91	169	125
Source: PBS&J analysis based on observed data for shorter duration openings, 2010.					

The queues projected for both a 10- and 20-minute bridge opening would typically extend past the upstream intersections for the Rio Vista Bridge with the highest queues occurring in the westbound direction and slightly higher during the AM peak hour for the 20-minute opening. Similarly, the Mokelumne Bridge experiences significant queues in excess of 135 vehicles and 165 vehicles during the PM peak hour for the 10-minute and 20-minute opening, respectively. Dispersion of queues resulting from the bridge openings is estimated to take between 7 and 9 minutes. The cumulative impact of bridge opening time and dispersion time increases the total corridor travel duration by approximately 50%.

Delay and Travel Speed

Intersection and mainline SR-12 operations are quantified using Level of Service (LOS) and a corresponding delay and speed value. Intersection LOS ranges from A (which indicates free flow or excellent conditions with short delays), to F (which indicates congested or overloaded conditions with long delays). The HCM methodology computes the average control delay for each approach to an intersection, expressed in terms of seconds/vehicle (sec/veh). For signalized and all-way stop controlled (AWSC) intersections, the control delay is computed by taking an average of the delay experienced by all vehicles on all approaches to the intersection and reporting an intersection-wide single average value. For two-way stop controlled (TWSC), the delay is computed for each approach separately and the delay on the worst approach is the value reported for the intersection. The control delay is then used to assign a LOS based on defined ranges in the HCM (Chapters 16 and 17).

The analysis of all intersections was performed using the Synchro (version 7) program based on input volumes conducted upstream of anticipated bottlenecks or locations of congestion to obtain true volume demand for the system. Inspection of these demand counts typically indicated no presence of volume metering (typically indicated by metrics such as absence of a volume plateau for the highest count period and uniformly high peak hour factors) due to congestion and were determined to be adequate for the analysis. This program uses the HCM methodology to determine LOS for intersections and reports the results in terms of control delay (sec/veh). For this analysis, intersection delay at signals are reported as an average delay for all approaches whereas unsignalized delay is the worst delay experienced by the side street. Operations on SR-12 are quantified based on average travel speed. Exhibit 4-11 contains LOS criteria for intersections. Exhibit 4-13 and Exhibit 4-14 summarize intersection and segment LOS for the SR-12 Corridor for the morning and evening peak period. Note that daily data could not be calculated due to the absence of PeMS data.

Results of the intersection analysis indicate that the signalized intersections on the west end of the corridor between I-80 and Walters Road through Suisun City experience the highest delays. These intersections experience high side-street and mainline volumes which result in higher control delays. These delay trends are reflected in slower travel times for these segments. A few of the unsignalized intersections function with higher delays for the side street. However, operations on SR-12 remain unaffected at these locations.

Exhibit 4-11: Delay Thresholds for HCM LOS

Level of Service	Signalized Intersection Delay (sec/veh)	Unsignalized Intersection Delay (sec/veh)
A	0 – 10	0 – 10
B	>10 - 20	>10 - 15
C	> 20 - 35	> 15 - 25
D	> 35 - 55	> 25 - 35
E	> 55 - 80	> 35 - 50
F	> 80	> 50
Source: Highway Capacity Manual, Transportation Research Board.		

Operations for a segment of roadway are typically quantified using LOS ranges similar to that of intersections. LOS for urban street segments is determined by the operating speed of the segment which is in-turn dependant on intersection operations. LOS for two-lane highways is determined by the amount of time vehicles spend in a platoon following other slower vehicles. The percent time spent following is a quasi measure of operating speeds and the degree of freedom available to vehicles. Exhibit 4-12 shows LOS criteria as defined in the HCM manual for roadway segments.

Exhibit 4-12: LOS Criteria for Roadway Segments

LOS	Two-Lane Highway		Class I Urban Street (45-55 mph)
	Time Spent Following (%)	Average Speed (mph)	Average Speed (mph)
A	≤35	>55	>42
B	>35-50	>50-55	>34-42
C	>50-65	>45-50	>27-34
D	>65-80	>40-45	>21-27
E	>80	≤40	>16-21
F	N/A	N/A	≤16
Source: Highway Capacity Manual, Transportation Research Board.			

Segment operations were quantified using travel speeds on the corridor. Segments on the west end of the corridor between I-80 and Walters Road through Suisun City experience the highest congestion due to the presence of signals with speeds between 20 and 45 mph. Segments operating under uninterrupted flow conditions in Sacramento and San Joaquin counties operate with speeds close to the posted speed limit (between 50 and 55 mph) which indicate a LOS range from LOS B to LOS C.. Mainline operations in the vicinity of I-5 are similar to those near I-80. Congested intersections experiencing noticeable delays shown on Exhibit 4-14.

Exhibit 4-13: Intersection LOS for SR-12

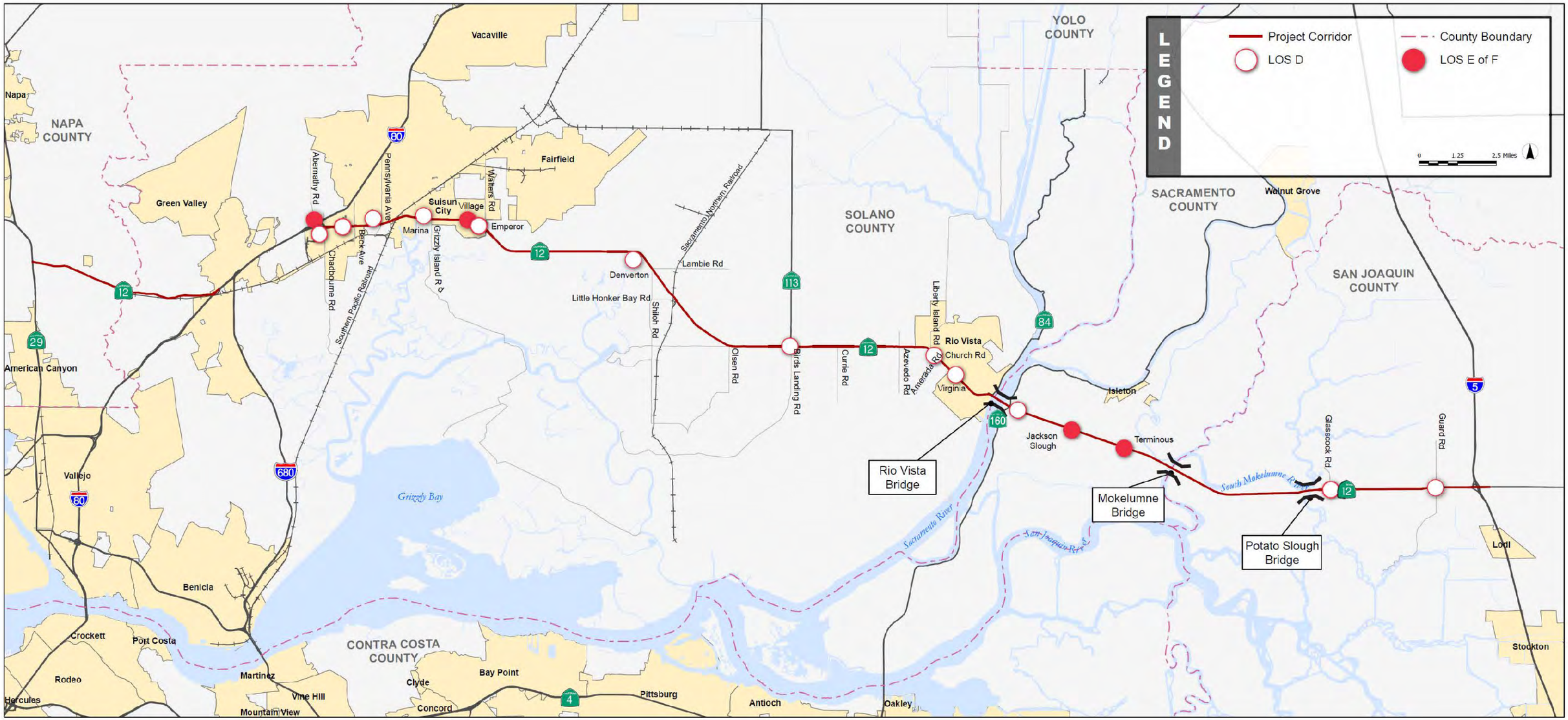
County	Intersection Name	AM		PM	
		Delay	LOS	Delay	LOS
Napa	SR-12 and SR-29+	115.8	F	67.1	E
	SR-12 and North Kelly Road+	37.4	D	32.8	C
Solano	SR-12 and Kirkland Ranch Road+	11.4	B	9.0	A
	SR-12 and Red Top Road +	-	F	206.9	F
	I-80 WB On Ramp & Abernathy Road *	48.3	E	12.1	B
	Auto Mall Pkwy & Abernathy Road	29.9	C	22.8	C
	SR-12 WB On Ramp & Abernathy Road	19.9	B	7.9	A
	SR-12 EB Off Ramp & Abernathy Road*	13.6	B	130.5	F
	Busch Drive & Chadbourne Ave	25.6	C	37.1	D
	SR-12 & Beck Avenue	33.9	C	45.7	D
	SR-12 & Pennsylvania Ave	54.3	D	41.2	D
	SR-12 & Parking Lot*	1.0	A	1.0	A
	SR-12 & Marina Boulevard	54.4	D	45.4	D
	SR-12 & Village Blvd*	86.4	F	43.8	E
	SR-12 & Sunset Ave	30.3	C	34.2	C
	SR-12 & Lawler Drive*	16.2	C	12.9	B
	SR-12 & Snow Drive*	18.4	C	12.2	B
	SR-12 & Emperor Drive	30.1	C	35.3	D
	SR-12 & Woodlark Drive*	14.2	B	11.0	B
	SR-12 & Walters Road	34.7	C	24.6	C
	SR-12 & Scally Road*	17.0	C	18.7	C
	SR-12 & Nurse Slough Road*	1.0	A	23.5	C
	SR-12 & Denverton Road*	11.6	B	26.2	D
	SR-12 & Shiloh Road*	1	A	24.0	C
	SR-12 & Little Honker Bay Road*	9.1	A	12.6	B
	SR-12 & SR-113*	16.0	C	33.3	D
	SR-12 & Summerset Drive	12.8	B	8.1	A
	SR-12 & Church Road*	27.6	D	21.8	C
	SR-12 & Hillside Terrace	22.0	C	18.7	B
	SR-12 & Gardiner Way*	17.3	C	16.9	C
	SR-12 & N 5th*	21.3	C	20.2	C
	SR-12 & Virginia Road*	23.7	C	34.2	D
	SR-12 & River Road*	13.5	B	18.7	C
Sacramento	SR-12 & SR-160	33.5	C	37.5	D
	SR-12 & Jackson Slough Road*	21.3	C	38.0	E
	SR-12 & Terminous Road*	24.0	C	256.7	F
	SR-12 & Brannan Island Road*	16.4	C	19.8	C
San Joaquin	SR-12 & Terminous Road*	19.5	C	24.7	C
	SR-12 & Glasscock Road*	18.9	C	31.9	D
	SR-12 & Correia Road*	10.8	B	19.5	C
	SR-12 & N Guard Road*	26.2	D	21.4	C
	SR-12 & I-5 SB Off-Ramp	8.6	A	15.6	B
	SR-12 & I-5 NB On-Ramp	19.6	B	20.6	C
	SR-12 & N Thornton Road*	10.0	B	11.6	B
	SR-12 & N Thornton Road	34.5	C	34.7	C
	SR-12 & N Flag City Blvd*	15.8	C	22.1	C

* Unsignalized Intersection

\+ Obtained from the Jameson Canyon Road Widening and SR-12/SR-29 Interchange Project Report (Final Draft, July 2007).

Bold designates intersections with poor conditions (i.e., LOS E or LOS F). Source: PBS&J traffic analysis, 2010.

Exhibit 4-14: Congested Intersections and Segments on SR-12



Source: PBS&J traffic analysis, 2010.

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Safety

Safety History

Safety has long been an issue on SR-12 and several previous projects and studies have identified sections of SR-12 with accident rates higher than the statewide average. In March 2007 alone there were six fatalities (in four accidents) on SR-12 within the study area. Because of these issues and concerns, improving safety has been a priority of Caltrans and the local transportation agencies.

The counties of Solano, Sacramento, and San Joaquin have been working collaboratively with Caltrans and the CHP to improve safety. A multi-faceted strategy has been developed for the SR-12 Corridor and includes four key elements: legislation, enforcement, public education and signage, and engineering. As part of this strategy, SR-12 has been designated a Safety Corridor. By early 2008, all elements of this strategy had been implemented.

Legislation - Assembly Bill (AB) 112 created a safety enhancement-double fine zone (DFZ) on SR-12 between I-80 and I-5.

Enforcement – AB 112 provides for increased enforcement by CHP on SR-12. CHP has received increased grant funding over the last several years to expand their enforcement efforts.

Education – A public outreach and education campaign to improve safety on SR-12 by educating the commuting public was initiated in 2007 and continues today. The campaign includes branding SR-12 as a Safety Corridor, and providing updates on enforcement efforts and the status of current and upcoming construction projects.

Engineering – In the summer of 2007, Caltrans implemented safety enhancement elements including re-striping a no passing zone from Suisun City to Rio Vista, adding radar speed detection and warning signs, and adding temporary changeable message signs (CMS) and other warning and speed limit signs. Caltrans also installed a temporary concrete barrier on the centerline between Walters Road and Shiloh/Lambie Road, channelizers on the centerline from Shiloh/Lambie Road to Currie Road in Solano County, and centerline and shoulder rumble strips on SR-12 in Sacramento and San Joaquin counties to I-5 where the outside shoulders are eight feet in width. These improvements were complete in the fall of 2007.

Following the implementation of these short-term safety elements, construction began on a State Highway Operation and Protection Program (SHOPP) project from west of Scally Road to Currie Road in Solano County. This project includes shoulder widening, intersection improvements, and vertical and horizontal alignment improvements. The project began construction in early 2009 with completion anticipated in early 2011.

It is worth noting that the SR-12 Bouldin Island SHOPP project is planned to start construction in 2012 for the San Joaquin segment of SR-12. This 4.5-mile project, between the Mokelumne Bridge and the Potato Slough Bridge, will provide full-width outside shoulders with rumble strips, a concrete median barrier, six-foot inside shoulders for the most part adjacent to the concrete barrier, and structural pavement. Additionally, the SR-12 Improvements Project from Rio Vista to I-5 is planned to start construction this year (2011). This purpose of this STIP-funded project is (1) a direct operational improvement by eliminating left turns at the Glascock Road intersection, along with installing left turn pockets and acceleration lanes at other major intersections between Little Potato Slough Bridge and I-5; and (2) to construct a “Smart” Corridor, by the installation of various Intelligent Transportation System (ITS) elements (e.g., CMS) to provide travelers real time information on the status of SR-12 between I-5 and I-80. These improvements are also expected to improve safety for this section of the SR-12 Corridor.

Accident Data

Accident data for the most current and available three and one-half year period was obtained from Caltrans Districts 4, 3, and 10 from the Traffic Accident Surveillance and Analysis System (TASAS) maintained by Caltrans. The project study area was divided into five segments, three in Solano County, one in Sacramento County, and one in San Joaquin County. The accident data period was January 1, 2006 to June 30, 2009, which covers the implementation of the short-term safety enhancement elements that occurred roughly in the middle of the data set.

Accident Rates

The section of SR-12 through Solano County was divided into three segments due to distinct geometric differences along SR-12. The first segment is a four-lane mixed divided expressway and arterial from I-80 to Walters Road; the second segment is a two-lane rural highway from Walters Road to the west edge of the City of Rio Vista; and the third segment is a mostly two-lane arterial segment through Rio Vista. The remainder of the SR-12 Corridor is a two-lane rural corridor through Sacramento and San Joaquin Counties.

Exhibit 4-15 presents a summary of the accident rates for the five segments along SR-12. The table shows the actual accident rates (fatal, fatal + injury, and total) and statewide average rates of similar facilities for comparison purposes.

Exhibit 4-15: Accident Rates

State Route 12		Actual Accident Rates[1] For Project Area			Statewide Average Accident Rates [1 2]		
Location	Post Mile	Fatal	Fatal + Injuries	Total	Fatal	Fatal + Injuries	Total
Solano County – 4 Lane (I-80 to Walters)	1.801 – 8.000	0.004	0.50	1.35	0.014	0.46	1.19
Solano County – 2 Lane (Walters to Rio Vista)	8.000 – 24.820	0.028	0.28	0.60	0.024	0.34	0.76
Solano County – 2 Lane (Rio Vista)	24.820 – 26.240	0.000	0.43	0.80	0.022	0.76	2.04
Sacramento County – 2 Lane	0.000 – 6.200	0.014	0.37	0.80	0.025	0.33	0.77
San Joaquin County – 2 Lane	0.000 – 11.499	0.045	0.35	0.76	0.025	0.33	0.78

1 – Reported accident rates are "accidents per million vehicle miles (MVM)".
2 – Statewide average rates represent an average for facilities similar to the study corridor.
Shaded boxes indicate accident rates higher than the state average.

As shown Exhibit 4-15, six of the fifteen accident rates for SR-12 are above the statewide average. Accident rates for two of these segments, the four-lane segment in Solano County (for total accidents) and the San Joaquin (for fatal accidents), are the most likely to be statistically significant when compared to the state average.

The four-lane Solano County segment is an urban segment of SR-12. Given that the fatal and the fatal plus injury accident rates are close to the state averages for similar roadway sections, the higher rate for total number of accidents (1.35 compared to the state average of 1.19 for similar facilities) could be attributed to congestion-related incidents and the numerous traffic signals in the Solano County urban segment. Details on the traffic operations are provided in the Existing Conditions Technical (ECT) Report (PBS&J, January 2011) for this Study.

The two-lane San Joaquin segment has experienced a significant number of fatalities compared to the state average of similar facilities (0.045 to 0.025, respectively). As described in the ECT Report, there are some geometrical and operation deficiencies on this segment of the corridor that will be addressed by near-term projects. Specifically, on the Bouldin Island segment of SR-12 (between the Mokelumne and Potato Slough bridges), a SHOPP project will provide a concrete median barrier and standard

width shoulders. For the full San Joaquin segment, the SR-12 Improvement Project will provide an ITS enhancements and intersection improvements that will improve overall operations and safety.

In summary, there were 897 total accidents in the three and one-half year analysis period within the study area, including 23 fatal and 333 injury accidents. These accidents resulted in 27 fatalities and 586 injuries. Exhibit 4-17, shows the different segments within the study area and location of the fatal accidents. Additional information on the fatal and injury accidents in relation to the year and type of accident is discussed below.

Segment Analysis

Each segment was analyzed in more detail to look at the number of accidents, detail of the fatal accidents, type of collisions, and primary collision factors. The following information, also depicted in Exhibit 4-16, is presented by County and each segment:

Solano County, District 4

There were 599 total accidents in the Solano County segment of SR-12 for the three and one-half year period. There were 10 fatal accidents and 208 injury accidents. Forty-eight percent of the accidents were rear-end and the primary collision factor was speeding.

I-80 to Walters Road (4-Lane) Segment - There were 380 total accidents in this segment for the three and one-half year period. There was one fatal accident and 139 injury accidents. The fatal accident occurred in 2006 and was a rear-end accident with a primary collision factor of speeding. 61% of the accidents were rear-end accidents and 23% were broadside and sideswipe accidents. These types of accidents are consistent with the urban characteristics and high number of intersections within this segment. The most common primary collision factors were speeding (58%) followed by other violations (15%) and improper turns (11%). There were eight accidents (2%) with a primary collision factor of influence of alcohol.

Walters Road to Rio Vista (2-Lane) Segment - There were 189 total accidents in this segment for the three and one-half year period. There were nine fatal accidents and 53 injury accidents. Three fatal accidents occurred in 2006, four in 2007 and one each in 2008 and 2009. Three of the four fatal accidents in 2007 occurred prior to the implementation of the accident safety reduction project. Six of the fatal accidents were head-on collisions and all but one occurred prior to the implementation of the short-term safety enhancement elements discussed above. Thirty-five percent of the accidents were hit-objects, followed by 20% rear-end, 14% sideswipe, 13% overturn, 8% broadside, and 6% head-on accidents. This rural section has a high number of hit-object accidents compared to the similar rural segments of Sacramento and San Joaquin counties, both of which have rear-end accidents as the highest number of accidents. The most common primary collision factors were improper turns (35%) followed by speeding (28%), other violations (14%), failure to yield (7%), and influence of alcohol (6%). There were 12 accidents related to the influence of alcohol.

City of Rio Vista (2-Lane) Segment - There were 30 total accidents in this segment for the three and one-half year period. There were 0 fatal accidents and 16 injury accidents. 57% of the accidents were rear-end accidents and 26% were broadside and sideswipe accidents. These types of accidents are consistent with what is expected on a higher speed corridor that enters a city with a reduced speed limit and the proximity to the moveable Rio Vista Bridge that causes traffic to stop at various times in the day. The most common primary collision factors were speeding (47%), improper turns (21%), failure to yield (10%), and influence of alcohol (10%). There were three accidents related to the influence of alcohol.

Sacramento County, District 3

2-Lane Rural Segment – There were 112 total accidents in this segment for the three and one-half year period. There were two fatal accidents and 50 injury accidents. The fatal accidents occurred in March 2006 and September 2007 and were both head-

on accidents. 44% of these accidents were rear-end accidents, 21% were sideswipes, 14% were broadsides, 8% were head-on and 6% were hit-objects. The most common primary collision factors were speeding (41%), other violations (21%), and improper turns (17%). There were seven accidents (6%) with a primary collision factor of influence of alcohol.

San Joaquin County, District 10

2-Lane Rural Segment – There were 186 total accidents in this segment for the three and one-half year period. There were 11 fatal accidents and 75 injury accidents. Five of the fatal accidents occurred in 2006, three in 2007 and three in 2008 and early 2009. Three of the fatal accidents were head-on accidents, two rear-end, three sideswipe, two overturn, and one broadside accident. 38% of these accidents were rear-end accidents, 19% were sideswipes, 16% were hit-objects, 13% were broadsides, 6% were head-on and 6% were overturn. The most common primary collision factors were speeding (38%), other violations (30%), improper turns (14%), and influence of alcohol (11%). This segment experiences a high number of primary collision factor caused by the influence of alcohol (21 accidents) compared to the other segments.

Change in Accidents by Year

As previously mentioned, short-term safety enhancements were made in 2007 to SR-12 and an expanded enforcement and education program was initiated. Analysis of the accidents by year indicates accidents are trending down overall. The three and a one-half year data periods covered 2006 to 2008 and half of 2009, so the best comparison for full year-to-year changes is between 2007 and 2008. This timeframe coincides with the SR-12 multi-strategy safety program implementation. Exhibit 4-16, below, compares the total number of SR-12 accidents for 2007 and 2008.

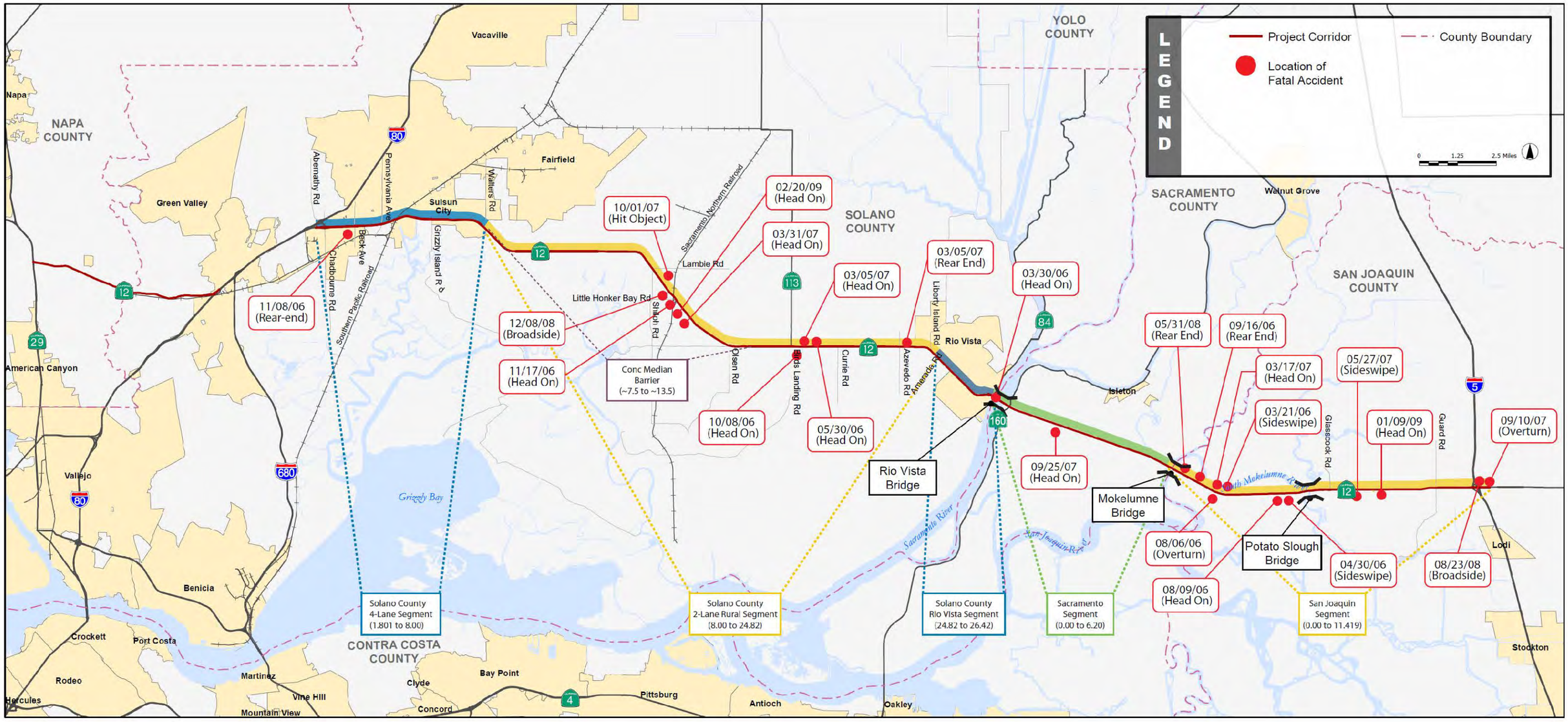
The total number of accidents is 17% lower in 2008 compared to 2007, from 283 accidents in 2007 to 235 accidents in 2008. As shown in Exhibit 4-16, there is only one segment, the middle Solano County (rural 2-lane roadway) segment, which experienced an increase in accidents between 2007 and 2008, from 42 to 49 respectively. The year-to-year change in accidents between 2007 and 2008 in the other segments is a decline between 14% and 40%. The largest decline in accidents occurred in the San Joaquin segment.

Exhibit 4-16: Accidents by Year

Segment	2006			2007			2008			2009 [1]			All Years Total Accidents
	# of Accidents	% of Total Segment	% of Total Corridor	# of Accidents	% of Total Segment	% of Total Corridor	# of Accidents	% of Total Segment	% of Total Corridor	# of Accidents	% of Total Segment	% of Total Corridor	
Solano County, 4-Lane (I-80 to Walters)	88	23%	10%	136	36%	15%	115	30%	13%	41	11%	5%	380
Solano County, 2-Lane (Walters to Rio Vista)	68	36%	8%	42	22%	5%	49	26%	5%	30	16%	3%	189
Solano County, 2-Lane (Rio Vista)	16	53%	2%	7	23%	1%	5	17%	1%	2	7%	0%	30
Sacramento County, 2-Lane	47	42%	5%	28	25%	3%	24	21%	3%	13	12%	1%	112
San Joaquin County, 2-Lane	56	30%	6%	70	38%	8%	42	23%	5%	18	10%	2%	186
Total	275	---	31%	283	---	32%	235	---	26%	104	---	12%	897

Note:
1 - Data does not cover entire year (January to June included).
Shaded boxes correspond to higher accident rate after safety enhancement implementations.

Exhibit 4-17: Location of Fatal Accidents



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To account for yearly changes in AADT, Exhibit 4-18 presents the accident rates in accidents per million vehicle miles (MVM) traveled. This table shows that the pattern of change in accident rates between 2007 and 2008 is similar to the downward trend in number of accidents for the same period described above.

As shown in Exhibit 4-18 the overall accidents in 2006 and 2007 are close in numbers, but total accidents are trending down in 2008 and into the first half of 2009, which the data shows is on pace to be lower than 2008. Comparisons of injury and fatal accidents between 2006 and 2009 show the same downward trend. Particularly fatal accidents which have dropped from 10 in 2006 to 7 in 2007 to 3 in 2008 after the safety enhancement implementations. In the San Joaquin County segment, it appears that the recent Caltrans safety enhancements, including elimination of passing opportunities and trial delineators/soft-barrier pylons have contributed to a reduction in accidents.

Exhibit 4-18: Accident Rates by Year

Segment	Accident Rates [1]				
	2006	2007	2008	2009 [2]	All Years [3]
Solano County, 4-Lane (I-80 to Walters)	1.10	1.68	1.51	1.09	1.42
Solano County, 2-Lane (Walters to Rio Vista)	0.75	0.45	0.58	0.72	0.65
Solano County, 2-Lane (Rio Vista)	1.43	0.63	0.55	0.44	0.89
Sacramento County, 2-Lane	1.18	0.70	0.60	0.66	0.87
San Joaquin County, 2-Lane	0.75	0.93	0.65	0.56	0.81
Total	0.92	0.94	0.86	0.77	0.94

Notes:
1 Reported accident rates are "accidents per million vehicle miles (MVM) traveled."
2 Data does not cover entire year (January to June included).
3 AADT values used to calculate accident rates for individual analysis years were obtained from Caltrans Traffic Data Branch and may differ slightly from the AADT values used in the TASAS reports. As a result, the sum of reported accident rates for all three analysis years may be slightly different than the TASAS rate.
Shaded box indicates higher accident rate after safety enhancement implementations.

As shown in Exhibit 4-16 and Exhibit 4-18, the overall accidents and accident rates in 2006 and 2007 are close, but total accidents and accident rates are trending down in 2008 and into the first half of 2009. Comparisons of injury and fatal accidents between 2006 and 2009 show the same downward trend; particularly fatal accidents which dropped from ten in 2006 to eight in 2007 and three in 2008 after the safety enhancement implementations. In the San Joaquin County segment, it appears that the recent Caltrans safety enhancements, including elimination of passing opportunities and trial delineators/soft-barrier pylons, may have contributed to a reduction in accidents.

Head-On Collision Summary

Head-on collisions have been a particular concern on the narrow SR-12 Corridor because of the severity of these types of accidents. Of the 23 fatal accidents in the three and one-half year data period, 12 were head-on collisions. Many of the short-term safety enhancement elements (centerline rumble strip, no passing zones, etc) were implemented to help reduce head-on accidents. The accident data was reviewed to determine if there has been a reduction in head-on accidents. Exhibit 4-19 shows the total number of accidents by year and summarizes fatal and injury accidents from these head-on accidents before (2006 and 2007) and after (2008 and 2009) the safety enhancements and overall safety strategy implementations.

Exhibit 4-19: Head-On Accidents

Segment	Before Safety Enhancements [1]			After Safety Enhancements [2]		
	Head-On	Fatal	Injury	Head-On	Fatal	Injury
Solano County, 4-Lane (I-80 to Walters)	4	0	3	4	0	1
Solano County, 2-Lane (Walters to Rio Vista)	8	5	2	4	1	3
Solano County, 2-Lane (Rio Vista)	1	0	0	0	0	0
Sacramento County, 2-Lane	5	2	2	4	0	4
San Joaquin County, 2-Lane	7	2	3	4	1	3
Head-On Accidents Total	25	9	10	16	2	11
Other Accidents (Non-Head-On) Total	533 (Non-Head-On)	9	201	323 (Non-Head-On)	3	119
All Accident Totals	558 (All Accident Types)	18	211	339 (All Accident Types)	5	130

Notes:
1 18-month period prior to safety enhancement implementation is January 2006 through June 2007.
2 18-month period following safety enhancement implementation is January 2008 through June 2009.

The data indicates that there has been a significant decrease in the total number and severity of head-on accidents as indicated by a dramatic decrease in the total number of head-on fatalities. Prior to the safety enhancement implementations, there were 25 total head-on accidents including nine fatal accidents. After all of the safety enhancement implementations were completed, there have been 16 total accidents including two fatal accidents. While head-on fatalities have decreased dramatically, head-on injuries have remained approximately the same. In addition to the reduction of head-on collisions and head-on fatalities, Exhibit 4-19 also demonstrates that the total number of accidents and their severity have also decreased significantly since the safety enhancement implementation. Although the comparison presented here does not take into account changes in AADT, it is clear the rates would correspond with the downward trend of the number and severity of head-on accidents because the difference is so substantial. Furthermore, the previous comparison of Exhibit 4-16 (number of accidents) and Exhibit 4-18 (accident rates) shows similar trends.

Center Concrete Barrier Implementation Results

As discussed above, a temporary concrete barrier was installed in October 2007 on the centerline between Walters Road and Shiloh/Lambie Road (PM 7.9 to PM 13.6). A review of traffic accidents was conducted for the three-year period before the completion of installation and the two-year period following installation of the temporary concrete barrier. Results of the review are presented in Exhibit 4-20.

Exhibit 4-20: Accidents between PM 7.9 and 13.6

	Before Installation (36 Months)	After Installation (24 Months)
Total Accidents	38	41
Injury	16	8
Fatal	1[1]	2[2]
Cross Centerline Fatal	1[1]	0

Notes:
1 Driver allowed vehicle to drift to the right, overcorrected to the left, and then crossed into opposing lane.
2 1st fatality involved trailer/tractor vehicle travelling westbound hitting the end of the temporary barrier with rear wheel and flipping. 2nd fatality involved vehicle travelling eastbound being broadsided by vehicle that failed to stop at stop sign while travelling northbound on Shiloh Road.
Source: Caltrans TASAS accident data.

Highway Approaches to Moveable Bridges

The project team met with Caltrans District 4 Bridge and Maintenance staff to gain input on the moveable bridge operations and safety issues they see with these operations. They discussed issues with vehicles driving through the crossing arms that are lowered when the bridges are being moved. Because of this issue, Bridge and Maintenance staff has changed the methods in which the crossing arms are operated. They now wait for the first car to stop at the traffic signal location before lowering the crossing arms. This can take several cars passing the stop location as some of the signal heads are difficult to see, and drivers unfamiliar with the moveable bridges on SR-12 do not expect a stop where there is no adjacent cross road. Queuing, up to one-half of a mile in length from the stop locations, has been observed during the operation of the Mokelumne and Rio Vista bridges.

Accident data within a half-mile of each bridge approach was reviewed. As shown in Exhibit 4-21 below, the number of accidents does not appear to be significantly high, but when you compare the total number of accidents at these bridge approaches to the adjacent segment totals, then these locations, which essentially operate as intersections during bridge movements, have high accident rates for the segment. Accident rates are particularly high at the Rio Vista and Mokelumne bridges, which open numerous times each day.

The type of accidents, high number of rear-ends and hit-objects, are consistent with what is expected in areas where vehicles come to a stop, and in areas where there is adjacent guardrail on the bridges and approaches. It cannot be determined from the data alone that all of the accidents near the bridge approaches are due to the lane closure and operation of the moveable bridges.

Exhibit 4-21: Accidents at Moveable Bridges

Bridge	Direction		Type of Accident [1]			
	Eastbound Approach	Westbound Approach	Rear-End	Hit-Object	Broadside/ Sideswipe	Other
	Total (% of Adjacent Seg.)					
Rio Vista Bridge (Solano EB approach, Sacramento WB approach)	8 (27%)	7 (6%)	73%	7%	7%	13%
Mokelumne Bridge (Sacramento EB approach, San Joaquin WB approach)	9 (8%)	14 (8%)	65%	22%	4%	9%
Potato Slough Bridge (San Joaquin EB and WB approach)	4 (2.2%)	3 (1.6%)	57%	29%	14%	0%

Note: Accidents for EB approach are only in EB direction of travel and vice versa for WB.
1 Totals are percentage of accidents for both approaches combined.

Locations with High Numbers of Accidents

The SR-12 Corridor, outside of the four-lane urban section in Solano County, is primarily a rural two-lane corridor with intersections spaced far apart. As such, the majority of the accidents are located outside of intersections. The number of accidents that occurred in intersections varied from 8% to 16% between the three counties. The data was reviewed to determine areas with higher accident totals. Locations that appear to have higher numbers of accidents are discussed below. The moveable bridge approaches discussed above fit into the category of spot locations with high accident rates.

- Four-lane urban Solano Segment: three signalized intersections, Beck Avenue (64 accidents), Pennsylvania Avenue (48 accidents) and Marina Boulevard (61 accidents), experience high accident rates. These three intersections each experienced between 12% and 17% of the entire number of accidents in this segment, and combine for 46% of all accidents in this segment. These intersections are signalized and experience high traffic volumes on both the mainline SR-12 and cross roads. Most of the accidents at these locations are rear-end type collisions.
- The SR-12 and SR-113 intersection in the rural two-lane section of Solano County segment had 16 accidents (8% of all accidents in this segment). The types of collisions were primarily rear-end and hit-object accidents.
- The SR-12 and SR-160 intersection in the Sacramento County segment just east of the Rio Vista Bridge had 19 accidents (17% of all accidents in this segment). The primary type of collision was rear-end and the primary collision factor was speeding, which is consistent with a remote intersection of two state highways.
- The intersections on SR-12 at the I-5 interchange in the San Joaquin segment had close to 30 accidents (16% of all accidents in this segment). The primary types of collision were rear-end and broadside/sideswipe accidents, which is consistent with the types of accidents at ramp terminals at interchanges.

Summary of Safety Issues

The accident data reviewed and evaluated for the SR-12 Corridor indicates the following points:

- For the three and one-half year period, most of the corridor still has accident categories (Total, Fatal, Fatal + Injury) higher than the statewide averages for similar facilities.
- The safety enhancement elements and multi-faceted safety strategy may be making a difference in the corridor as there has been downward trend in accidents and a larger downward trend/decline in the severity of accidents, particularly fatal accidents, between 2007 and 2008 after the full implementation of these initiatives.
- There is a downward trend in severity, fatal accidents, and head-on accidents.
- The section of SR-12 that has a temporary concrete barrier on the centerline is experiencing an increase in the number of hit-object accidents. However, the total number of accidents is about the same as previous years and the potential for head-on accidents, which used to be a major issue in this section, has been eliminated.
- The approaches to moveable bridges appear to be high accident locations.

Summary of Section 4

This section presents an evaluation of corridor performance based on vehicle delay and congestion. This section describes the methodology and measures used to identify existing congested areas; provides an evaluation of travel delay and speed; evaluates the impact of moveable bridge openings on traffic delay; and provides an assessment of accidents and incidents for the corridor. A summary of key issues addressed in this section include:

- *Travel Times:* Travel time data indicates the presence of low average speeds on the west end of the corridor between I-80 and Walters Road through Suisun City. Presence of lower speeds is observed on segments that carry the highest corridor volumes between Abernathy and Walters Road. Slower speeds were also observed in the vicinity of Rio Vista and near the I-5 interchange, which can be attributed to the presence of a signal and closely spaced intersections. The remaining segments of the corridor operated close to posted speed limits with little to no congestion.
- *Intersection Delay:* The signalized intersections on the west end of the corridor (between Beck Avenue and Walters Road) experience the highest delays. These delay trends are reflected in slower travel times for these segments. A few of the unsignalized intersections function with higher delays for the side street; however, operations on SR-12 remain unaffected at these locations. Similarly, segments on the west end of the corridor (between I-80 and Walters Road) experience the highest congestion due to the presence of signals. Segments operating under uninterrupted flow conditions in Sacramento and San Joaquin counties operate with acceptable LOS (LOS C or better). Mainline operations in the vicinity of I-5 are similar to those near I-80.
- *Impact of Moveable Bridges:* Operations of the movable bridges (Rio Vista and Mokelumne) have significant impacts on the corridor travel time. The frequency of bridge openings ranges from one to two times daily during winter months, to more than 6 times per day during peak summer months on the Mokelumne Bridge. Bridge openings add approximately 30 minutes of delay, which leads to travel times that are 50% longer than normal travel times. The bridge openings also induce queues in excess of 200 vehicles in the peak direction.
- *Safety:* The safety enhancement elements and multi-faceted safety enhancement strategy adopted in 2007 appear to be making a difference in the corridor as there has been downward trend in accidents and a larger decline in the severity, particularly fatal accidents, between 2007 and 2008 after the full implementation of these initiatives. However, most of the corridor still has accident categories (Total, Fatal, Fatal+Injury) higher than the statewide averages for similar facilities.
- *Centerline Barrier Safety:* Review of accident data from the 3 years before and 2 years after installation of a temporary concrete barrier on the centerline of the section of SR-12 between Walters Road and Shiloh Road indicate a reduction in the number of injury accidents and elimination of fatalities due to vehicles crossing the centerline. However, the total number of accidents has not decreased and may be attributed to an increase in collisions with the barrier due to minimal inside shoulder width.
- *Bridge Approach Safety:* The approaches to moveable bridges appear to be experiencing high accident rates.

These key issues will be evaluated during the development of the future conditions analysis to determine the impact of forecasted conditions and to identify improvement strategies to mitigate corridor safety, congestion, and operational issues along the corridor.

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Appendices

Appendix A: Daily and Hourly Variations in Traffic Volumes

Appendix B: Detailed Traffic Volume Information

Appendix C: Seasonal Variations in Traffic Volumes

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Appendix A: Daily and Hourly Variations in Traffic Volumes

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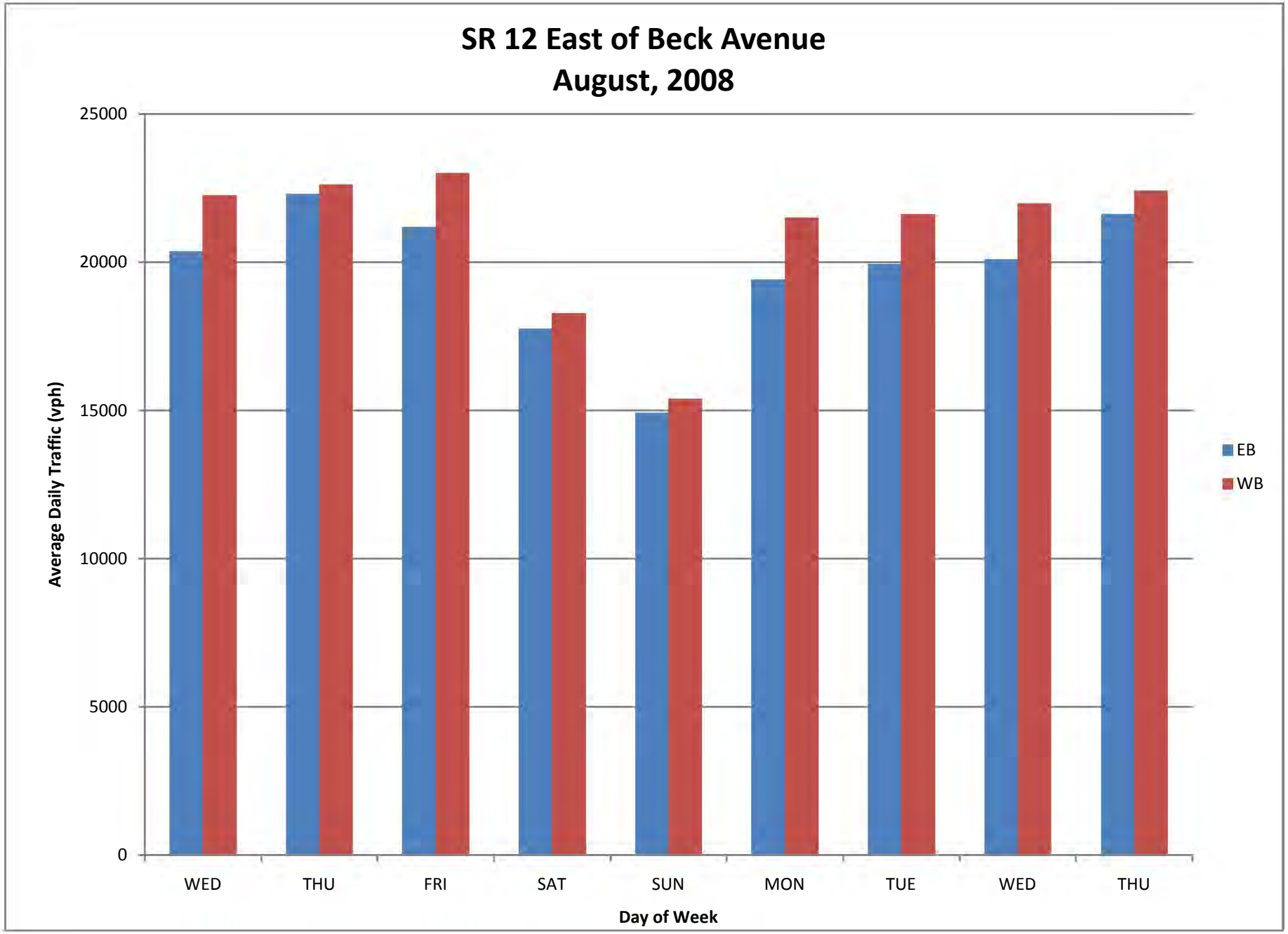
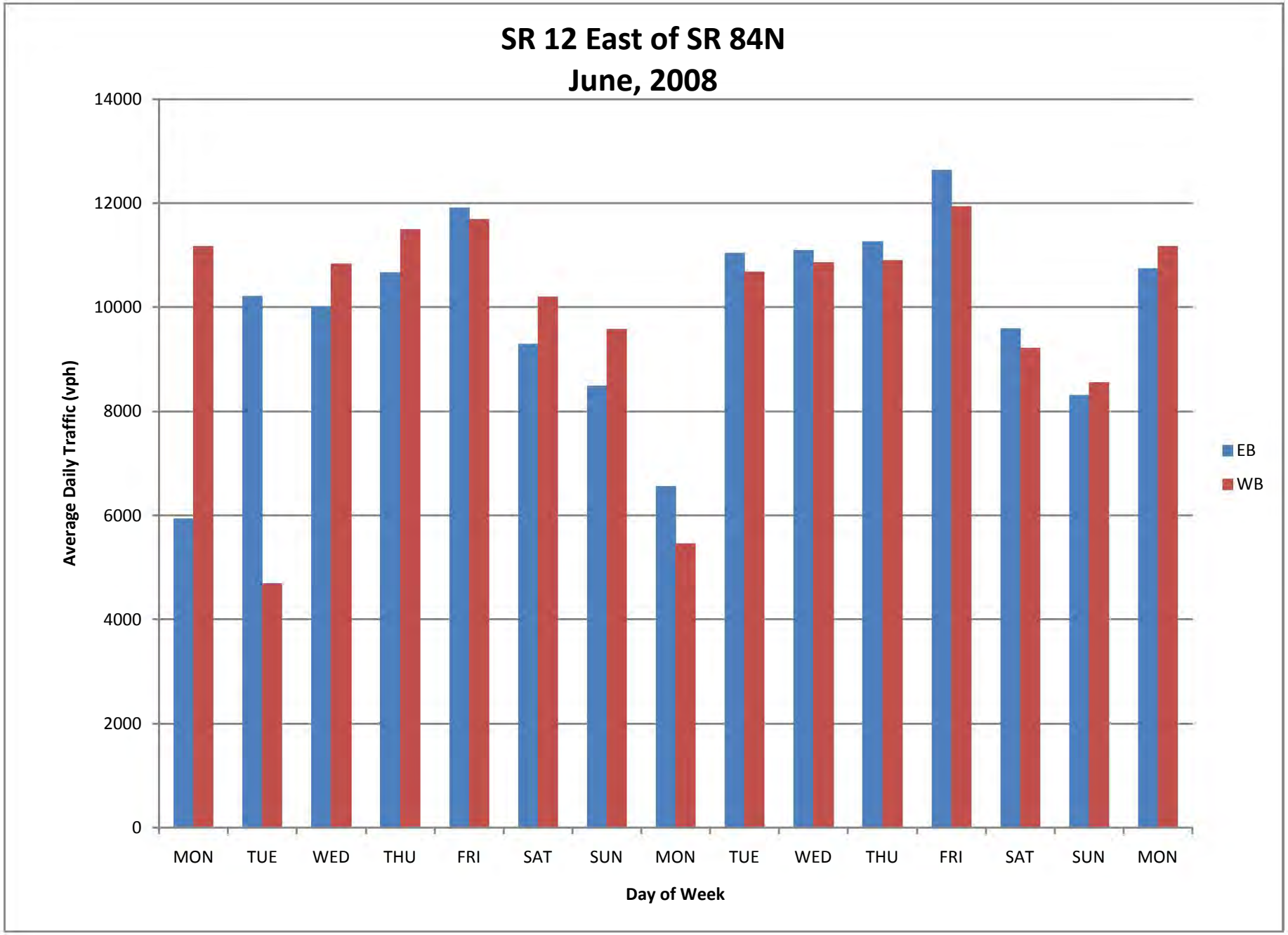
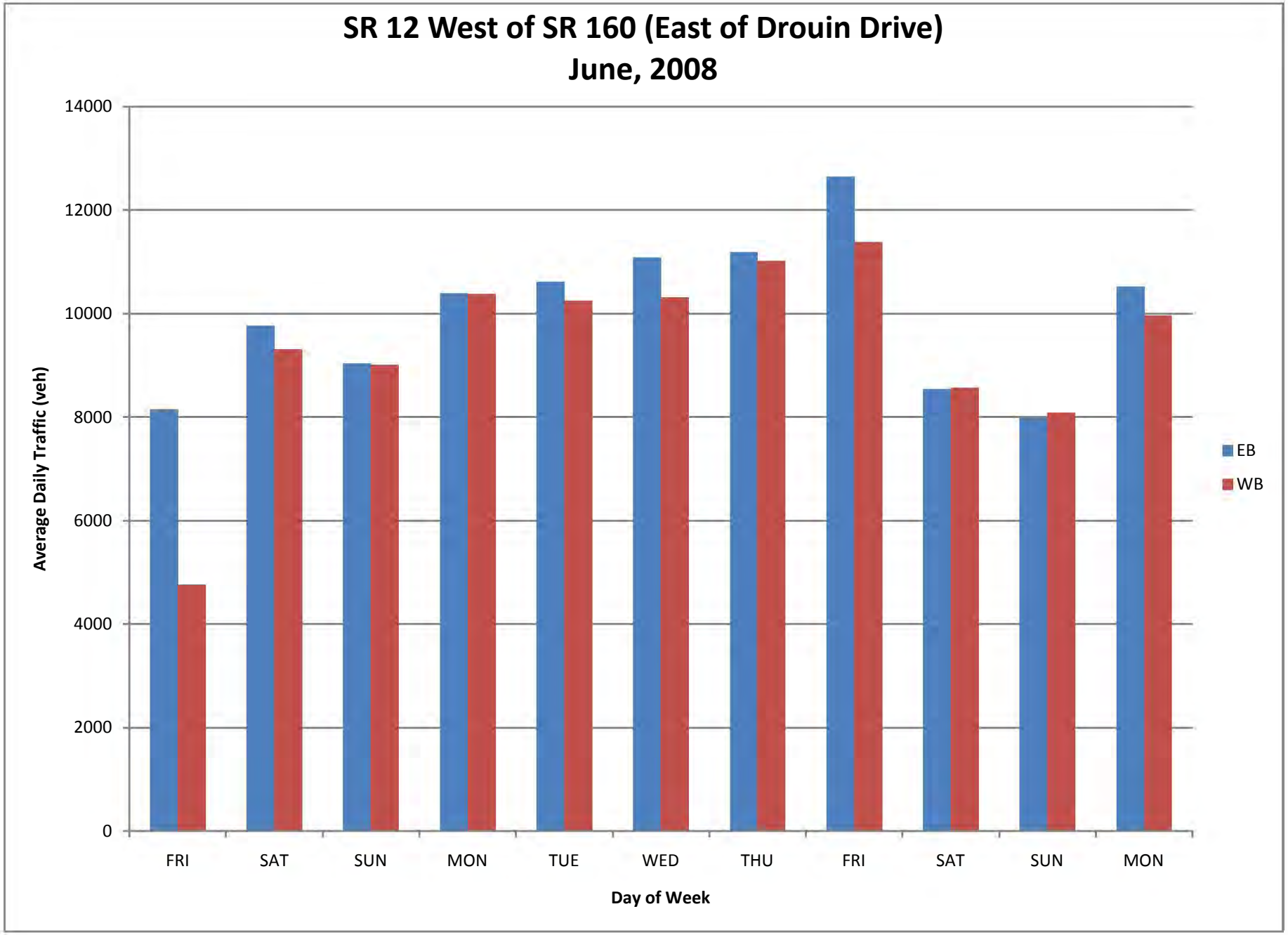
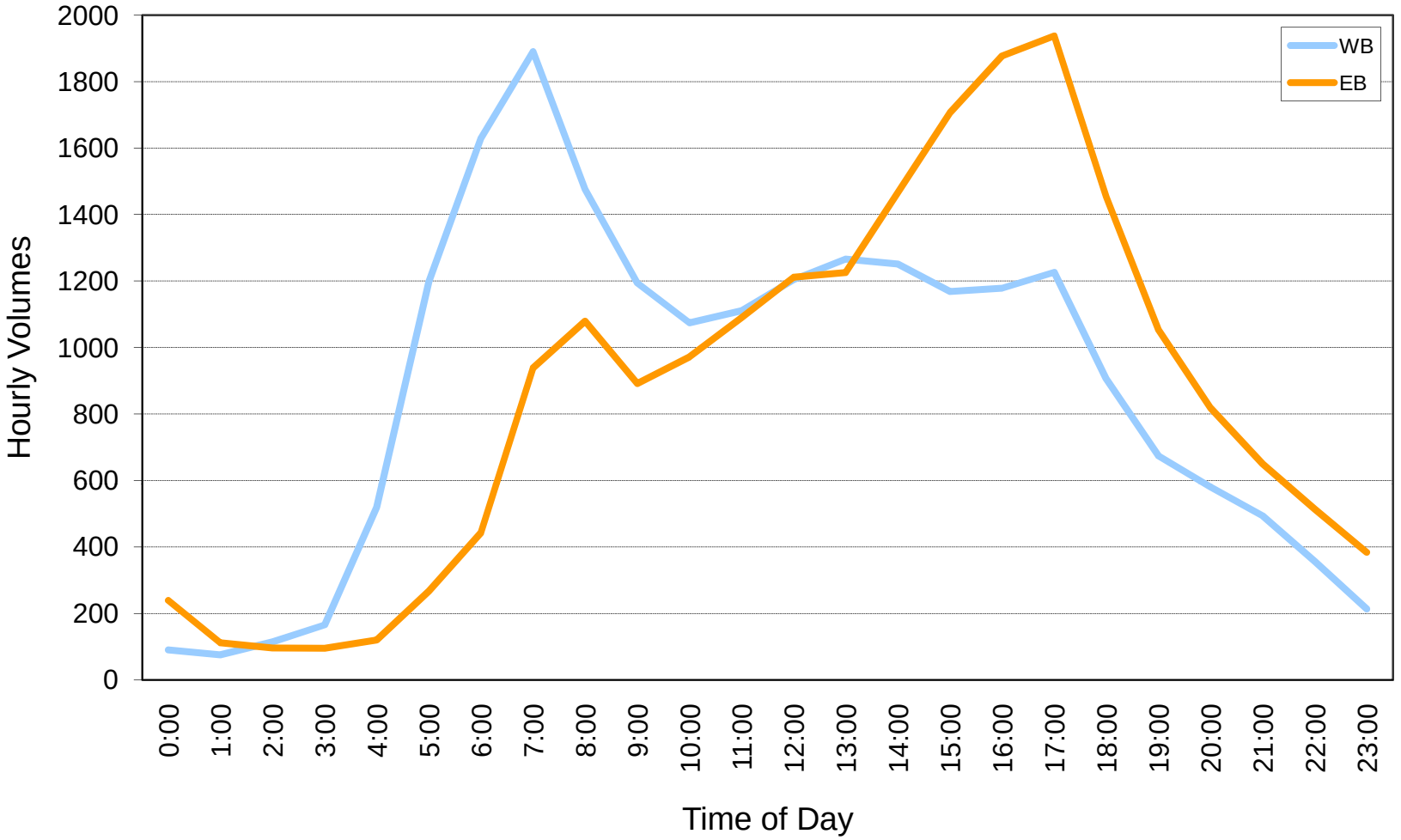

SR 12 East of Beck Avenue
August, 2008
Average Daily Traffic (vph)
25000
20000
15000
10000
5000
0
WED
THU
FRI
SAT
SUN
MON
TUE
WED
THU
Day of Week
EB
WB

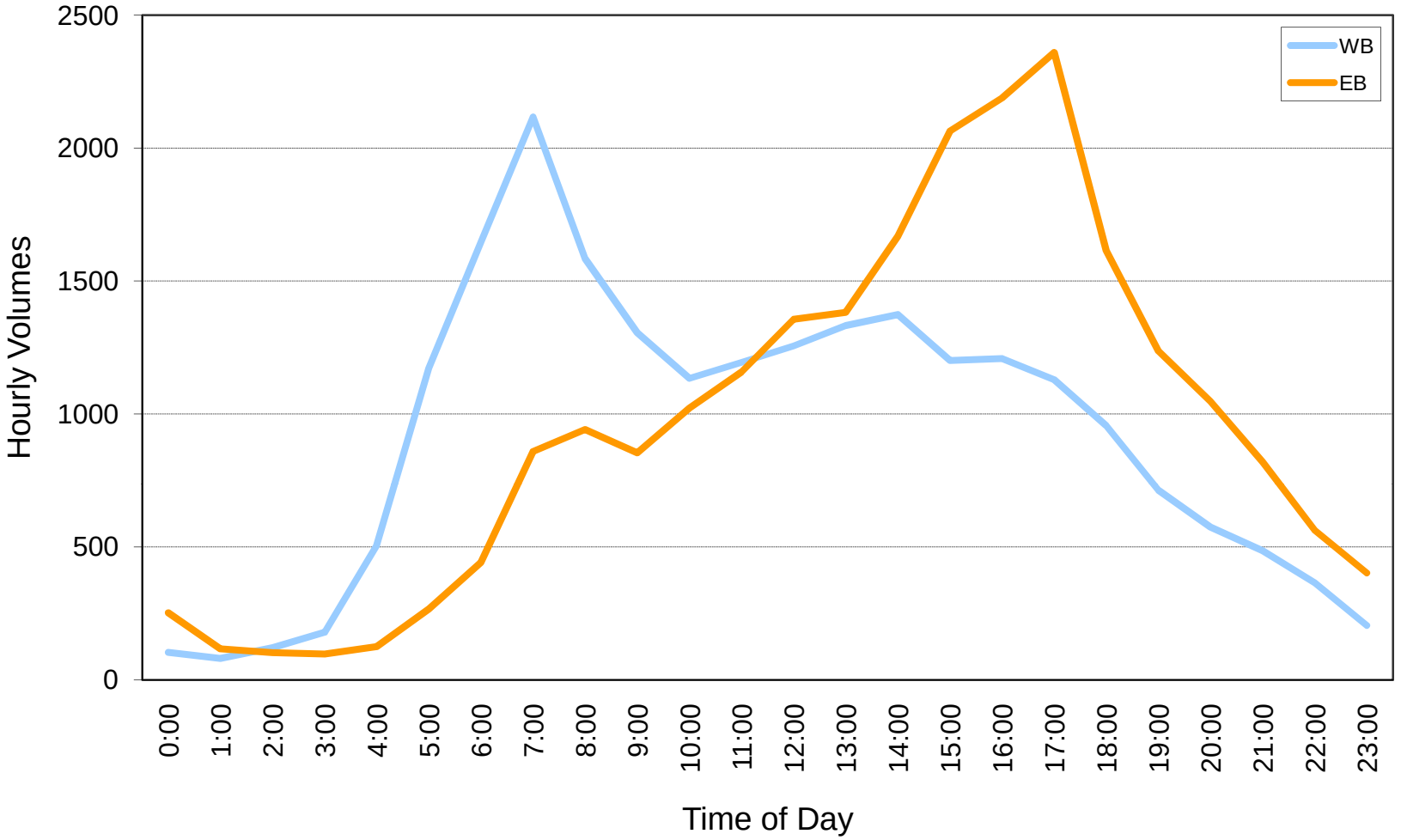

SR 12 East of SR 84N
June, 2008
14000
12000
10000
8000
6000
4000
2000
0
Average Daily Traffic (vph)
MON
TUE
WED
THU
FRI
SAT
SUN
MON
TUE
WED
THU
FRI
SAT
SUN
MON
Day of Week
EB
WB


SR 12 West of SR 160 (East of Drouin Drive)
June, 2008
Average Daily Traffic (veh)
14000
12000
10000
8000
6000
4000
2000
0
FRI
SAT
SUN
MON
TUE
WED
THU
FRI
SAT
SUN
MON
Day of Week
EB
WB

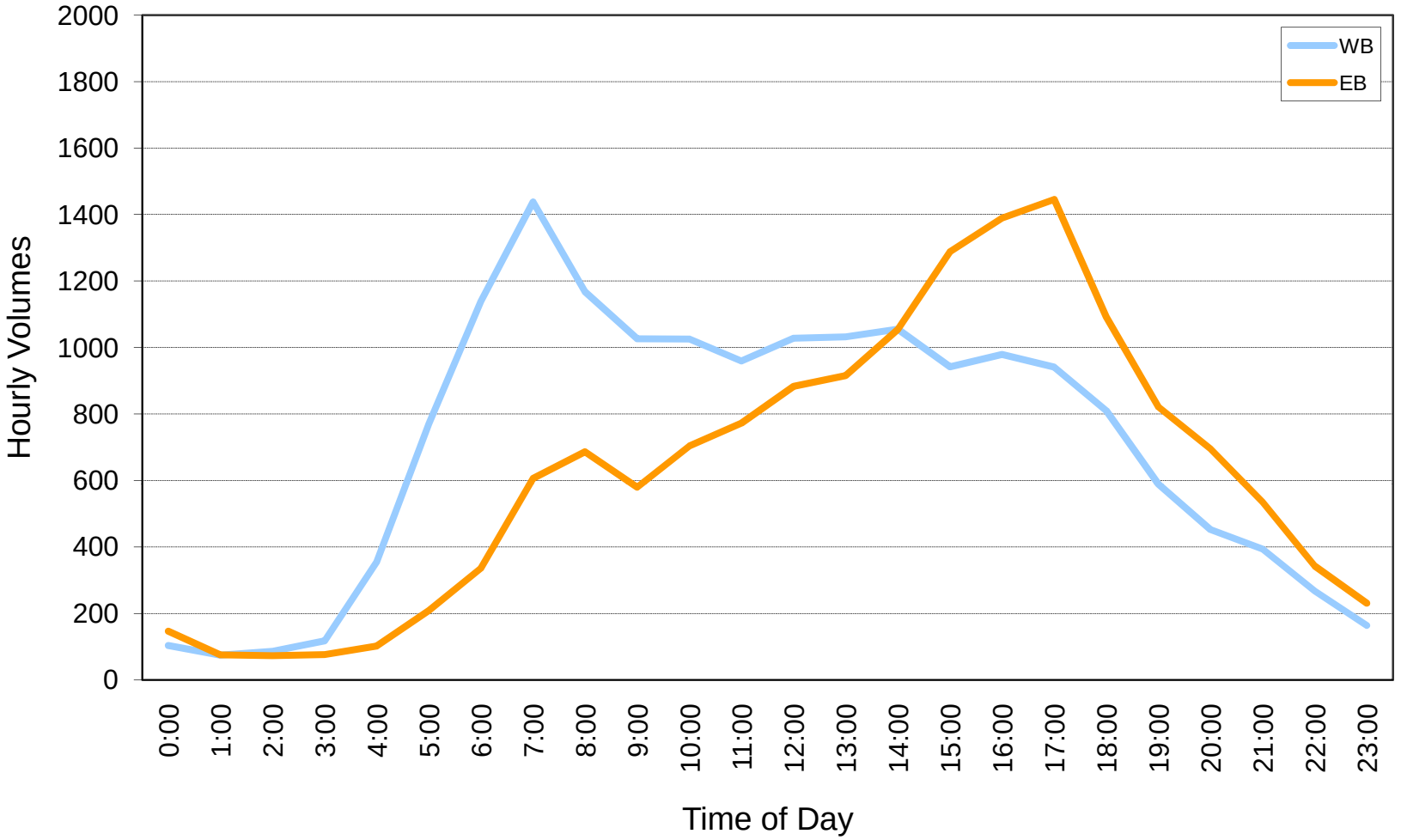
SR 12 Hourly Volumes Between Beck Ave and Pennsylvania Ave
Weekday, May 25-27, 2010



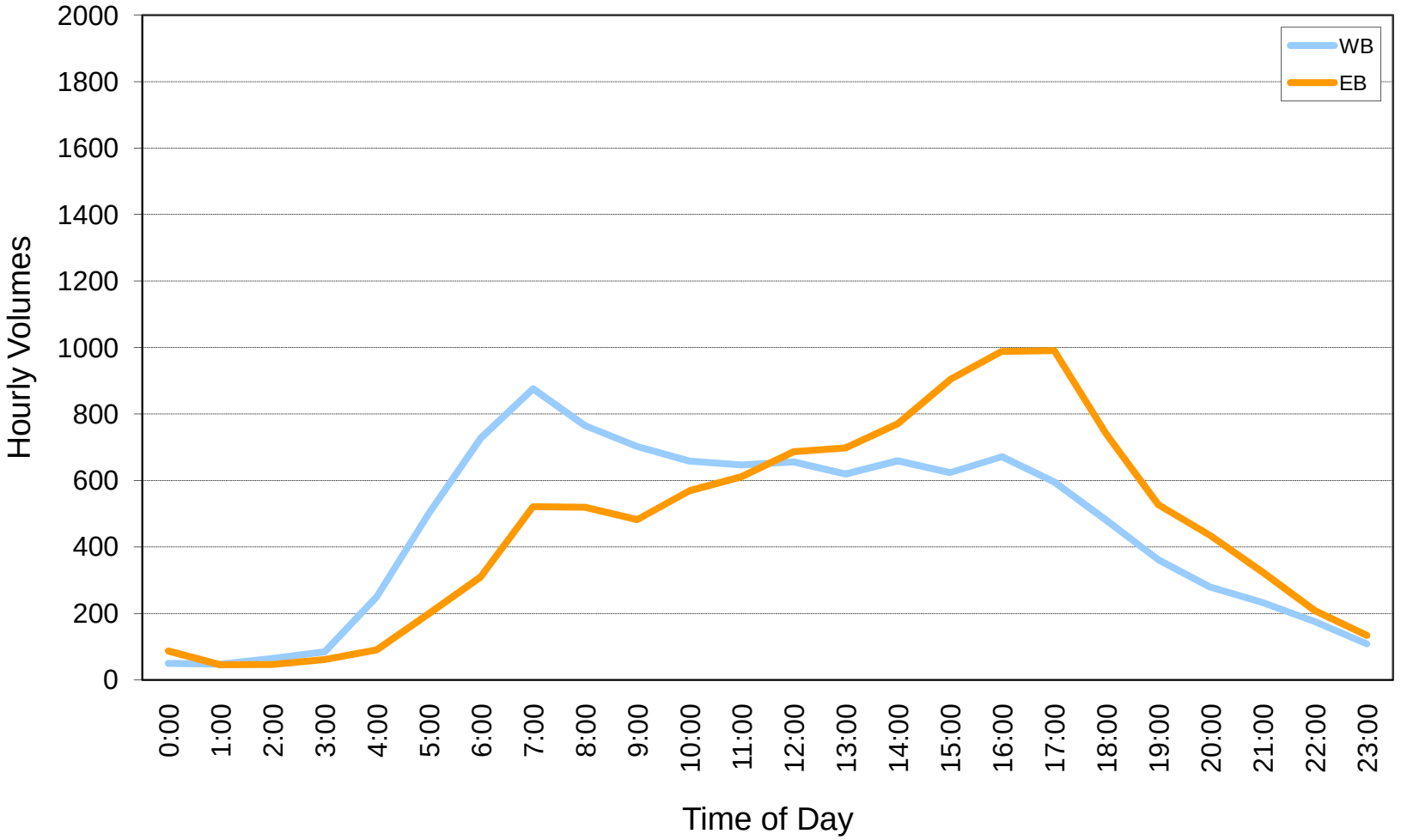
SR 12 Hourly Volumes Between Main Street I/C and Marina Boulevard
Weekday, May 25-27, 2010



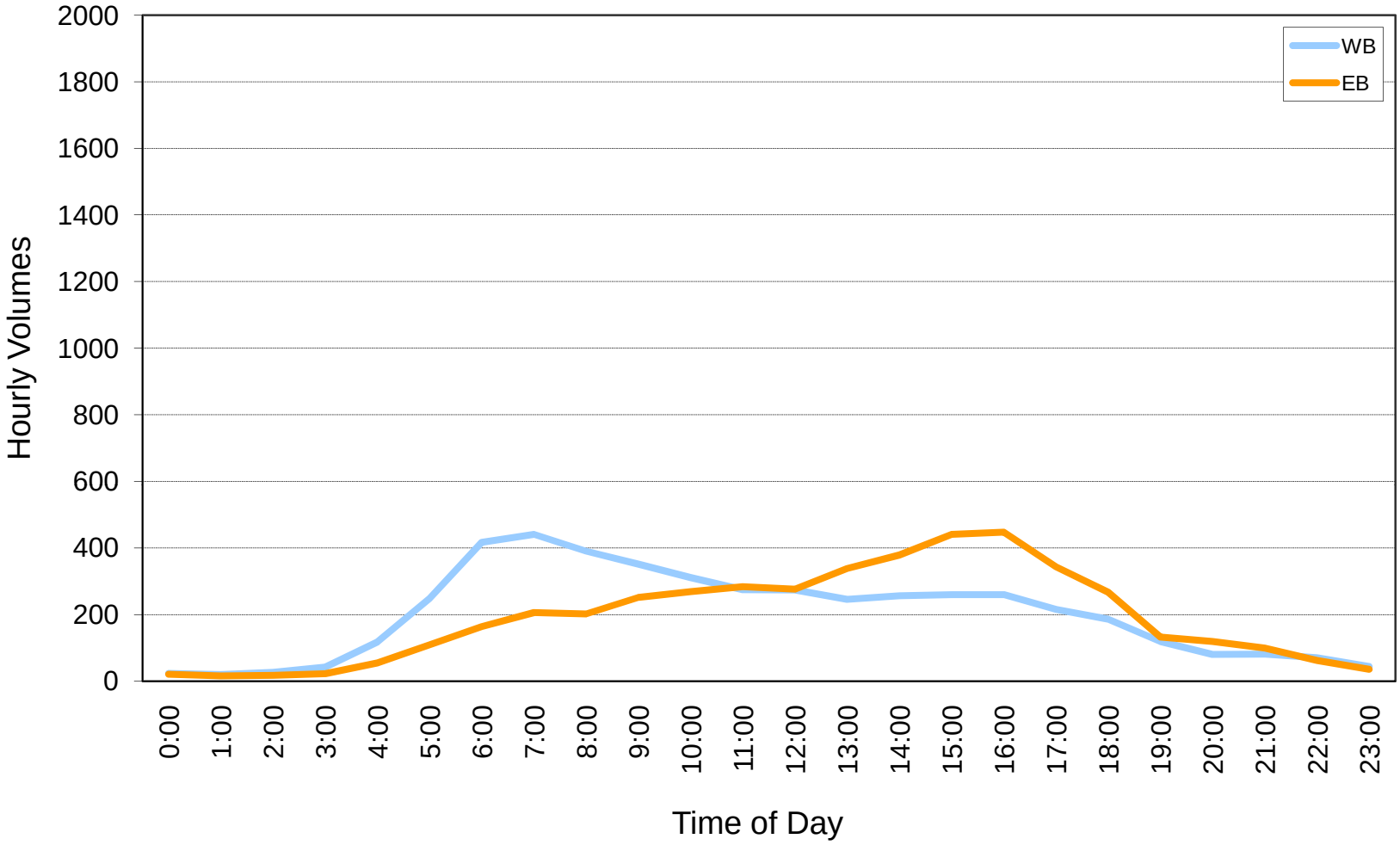
SR 12 Hourly Volumes Between Marina Boulevard and Emperor Drive
Weekday, May 25-27, 2010



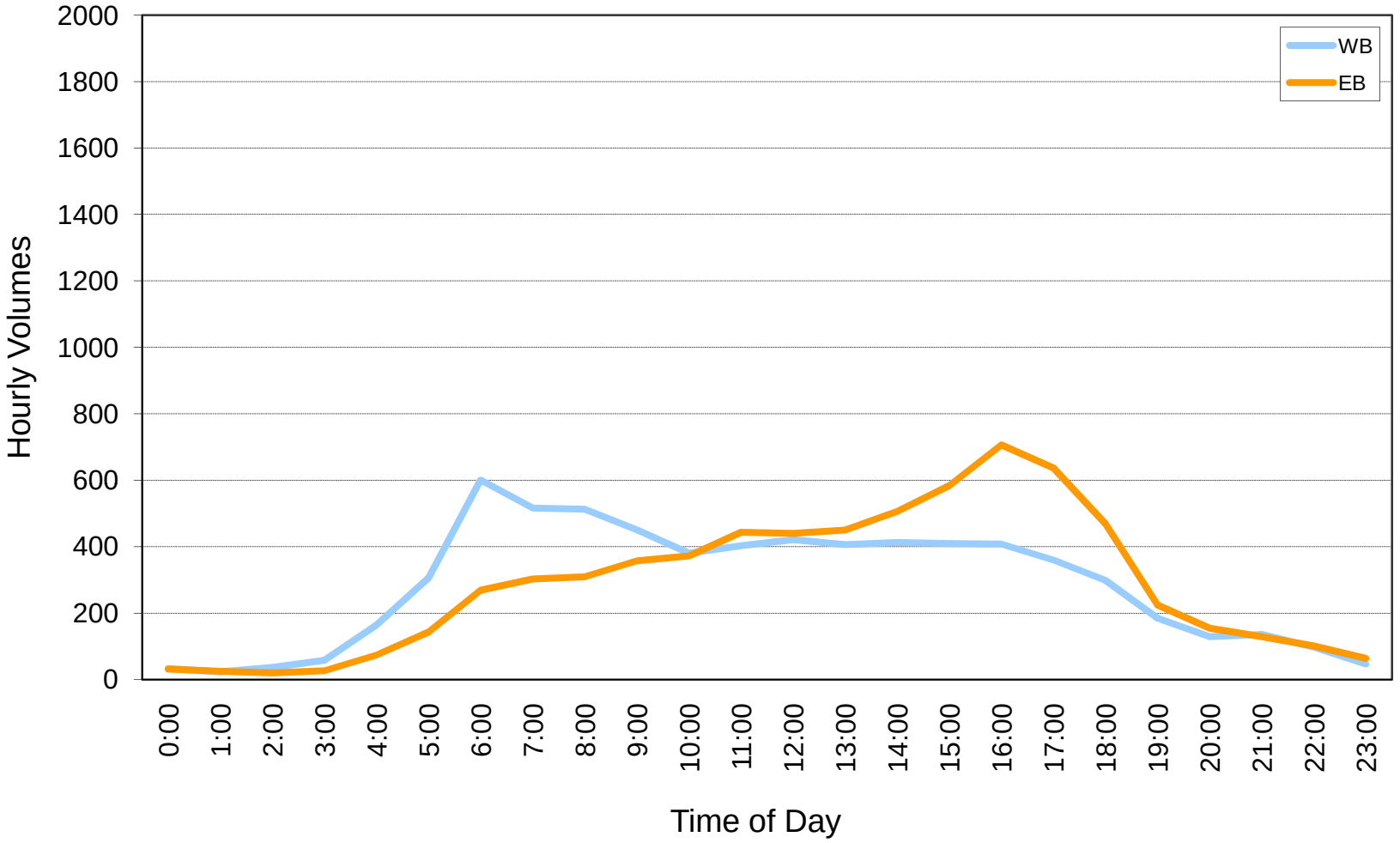
SR 12 Hourly Volumes Between Marina Boulevard and Emperor Drive
Weekday, May 25-27, 2010



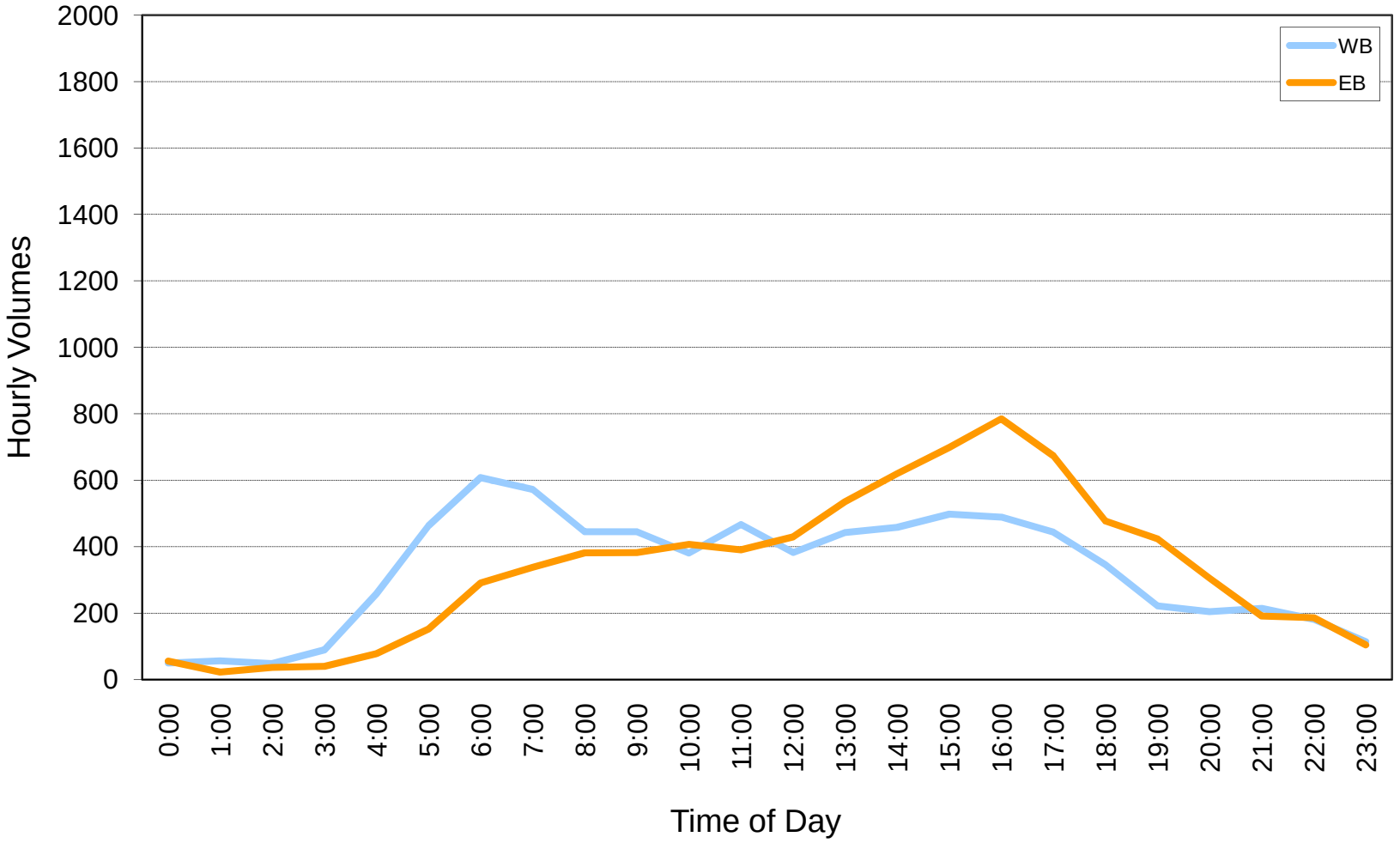
SR 12 Hourly Volumes Between Walters Rd & Shiloh Rd
Weekday, May 25-26, 2010

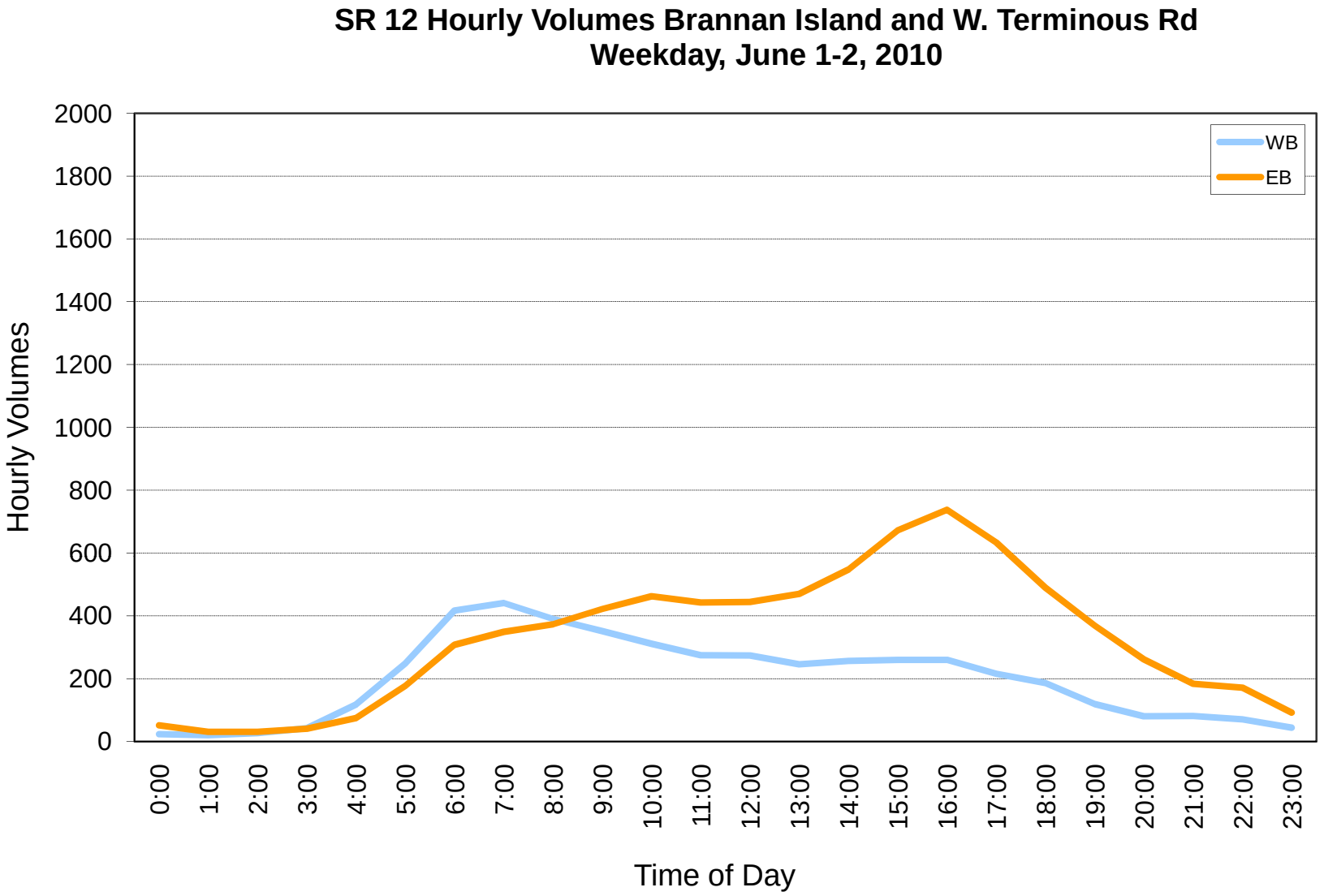


SR 12 Hourly Volumes Between Summerset Drive and Main Street
Weekday, May 25-26, 2010

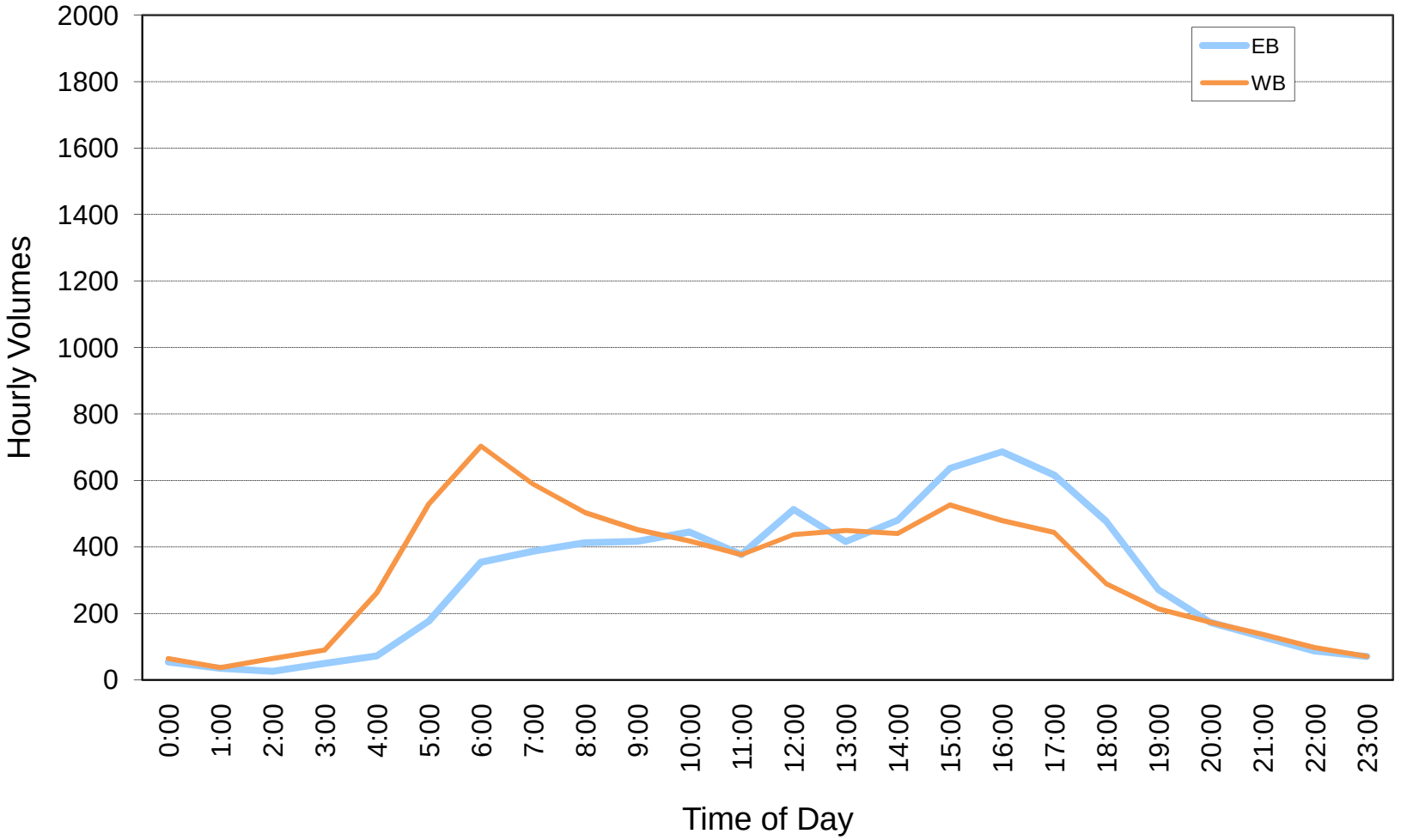


SR 12 Hourly Volumes Between SR-160 and Brannan Island Road
Weekday, May 25-26, 2010

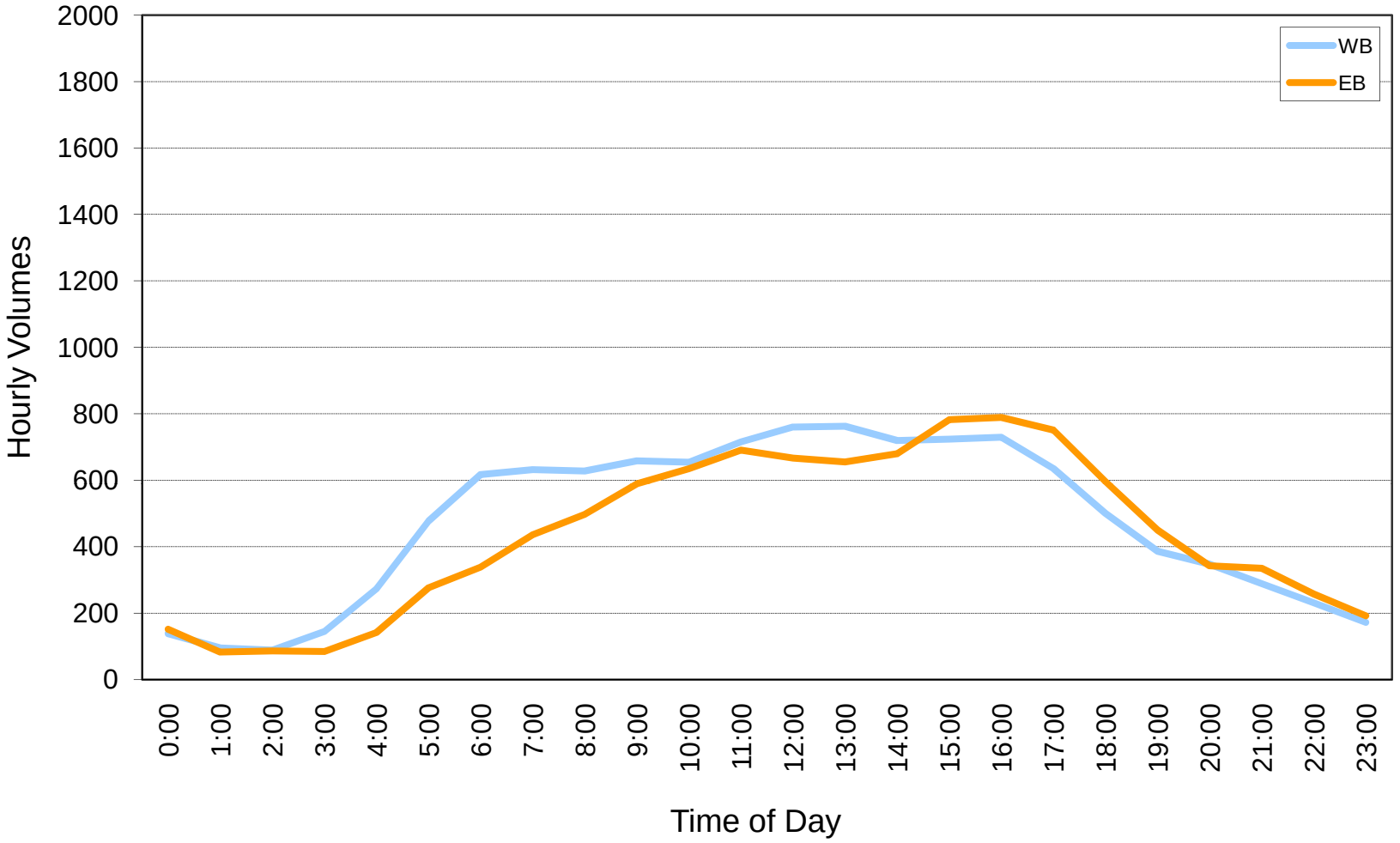



SR 12 Hourly Volumes Brannan Island and W. Terminous Rd
Weekday, June 1-2, 2010
Hourly Volumes
2000
1800
1600
1400
1200
1000
800
600
400
200
0
WB
EB
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time of Day

SR 12 Hourly Volumes Between W. Teminous Rd & I-5 SB Ramps
Weekday, June 1-3, 2010



SR 12 Hourly Volumes East of I-5 Interchange
Weekday, May 25-26, 2010



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Appendix B: Detailed Traffic Volume Information

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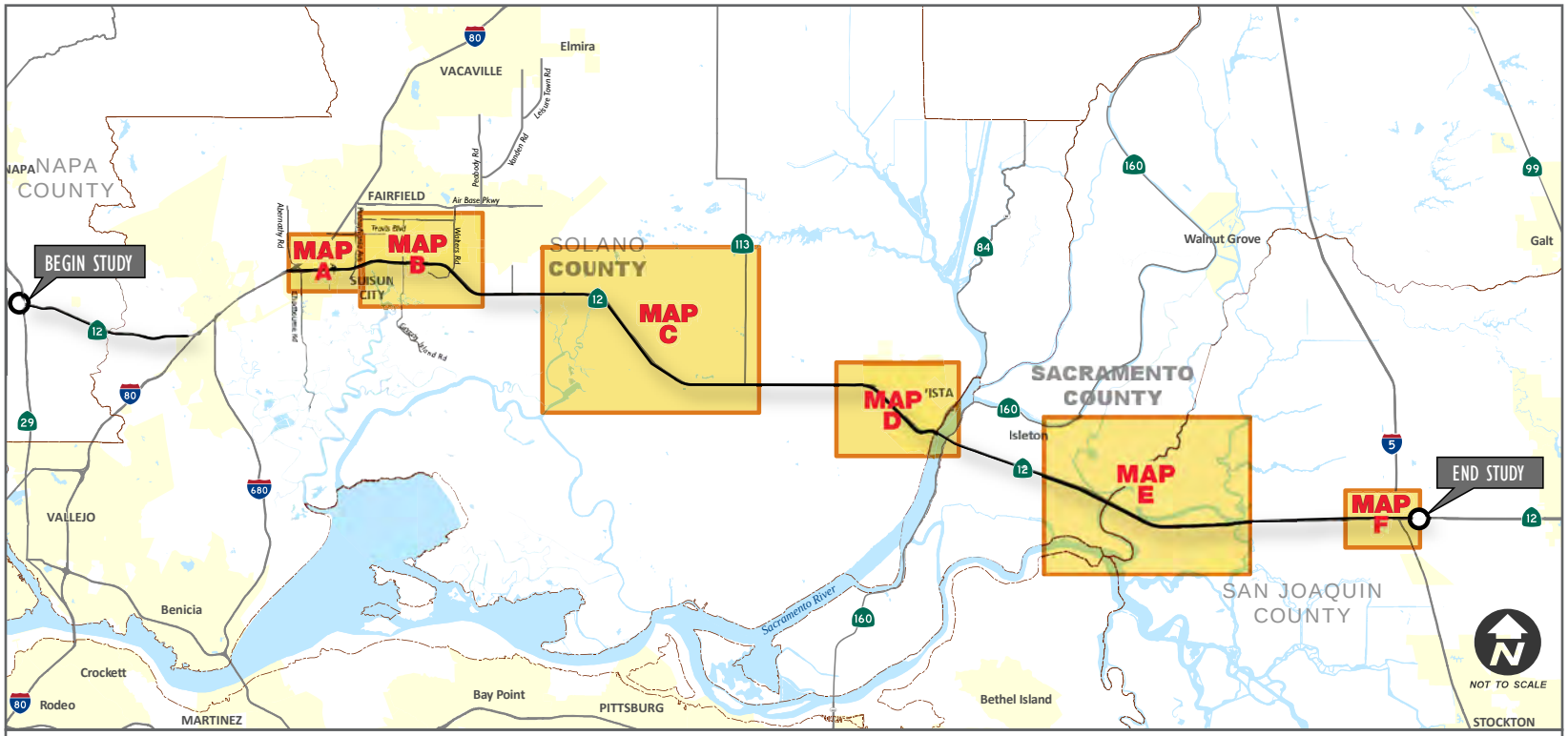
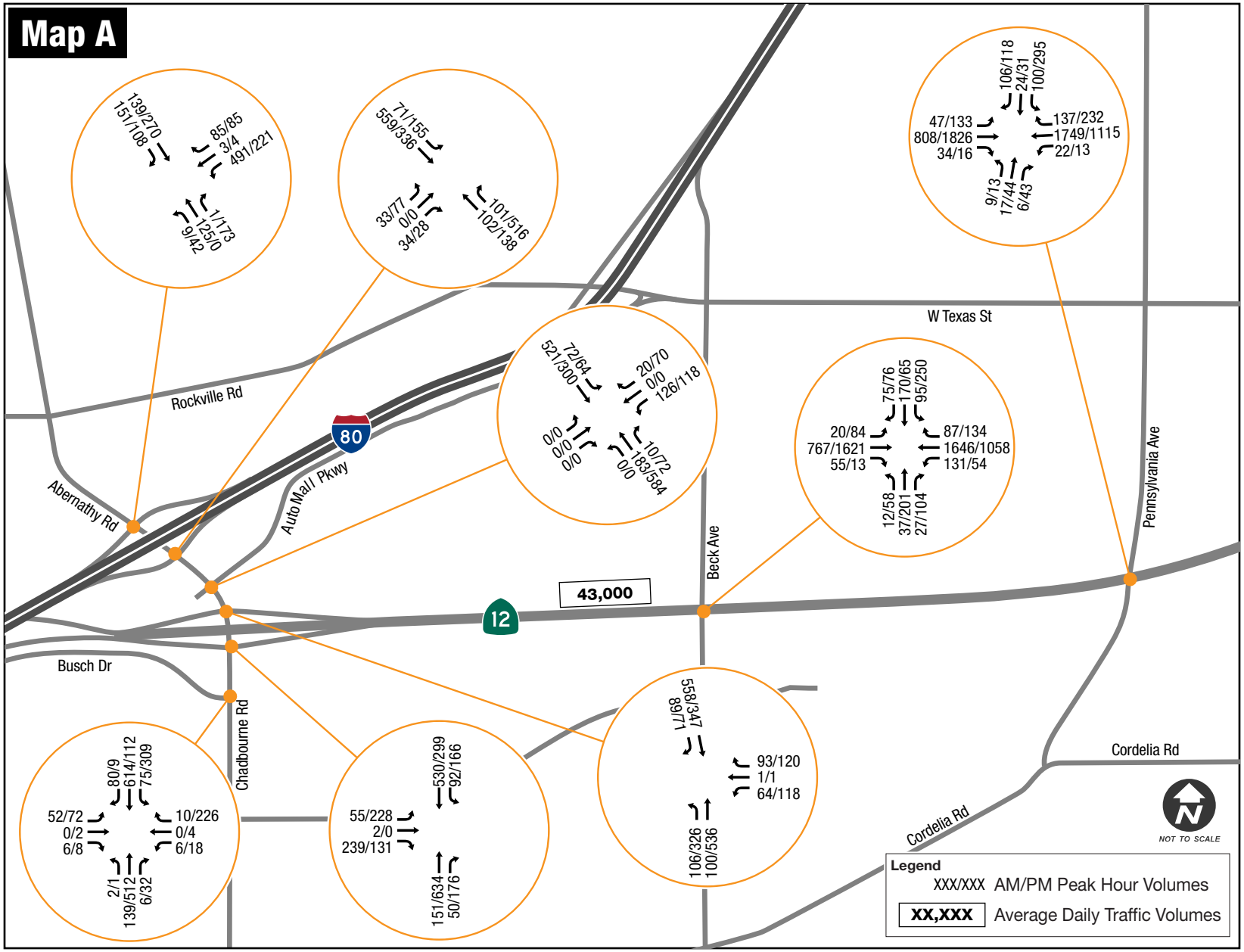
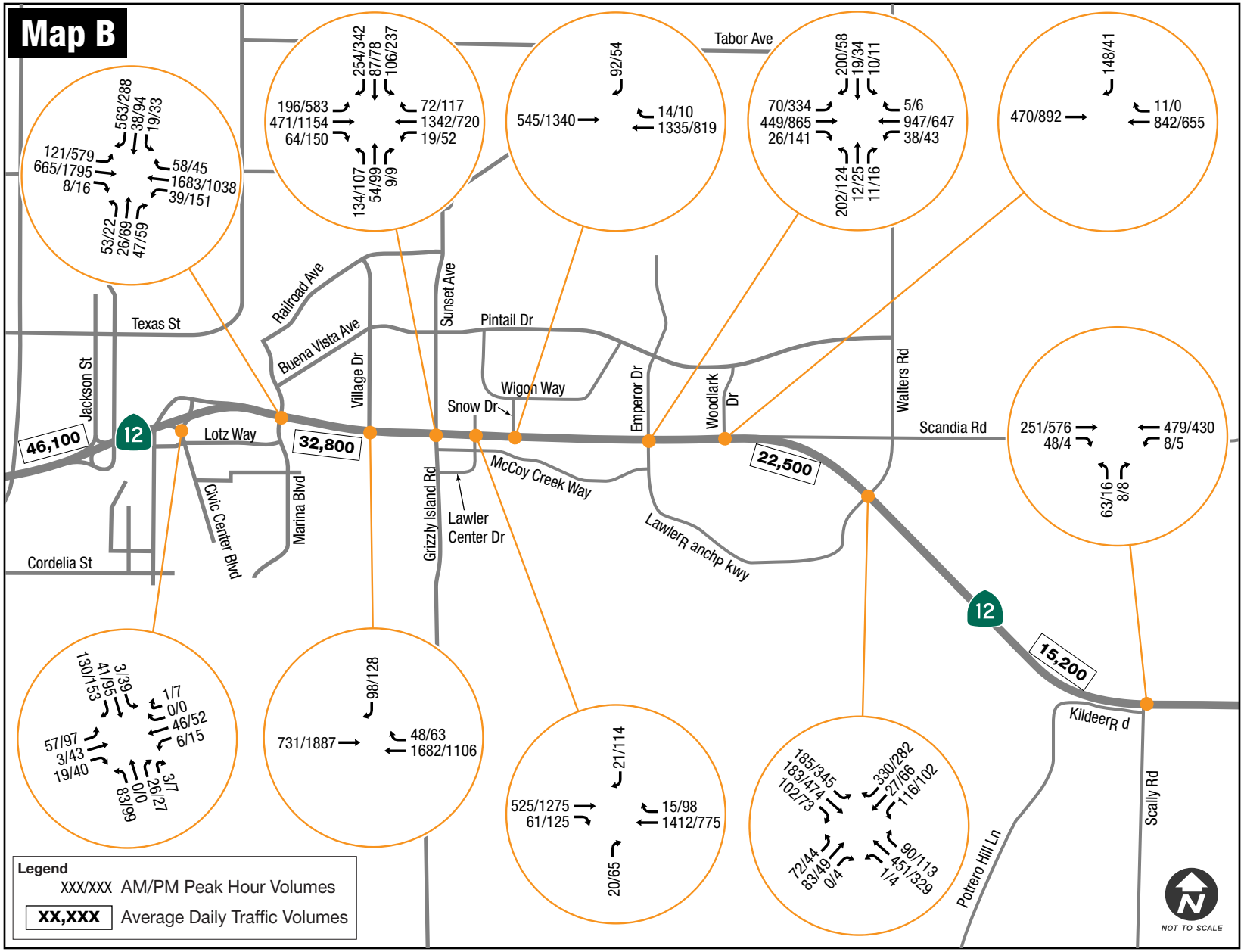


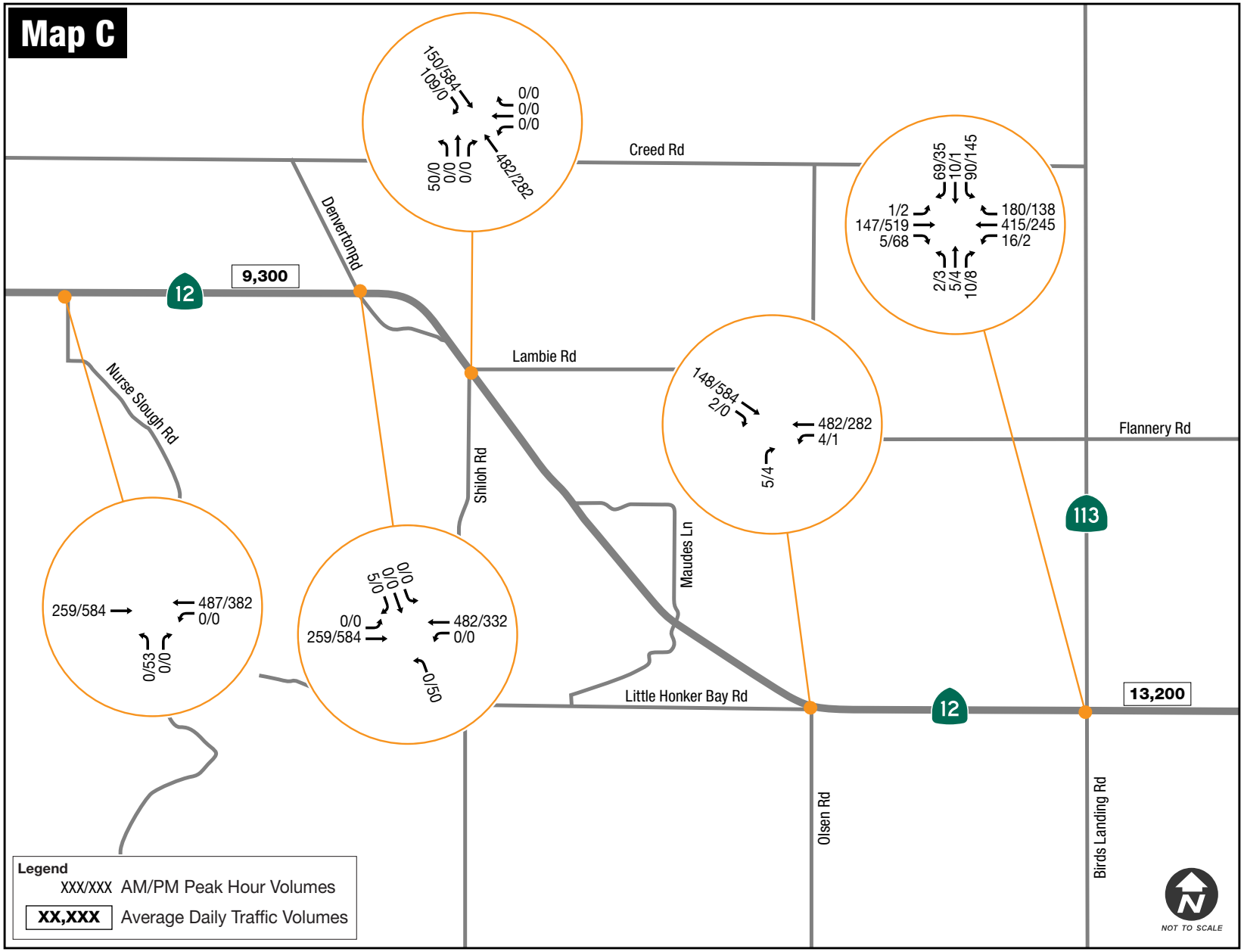
Legend

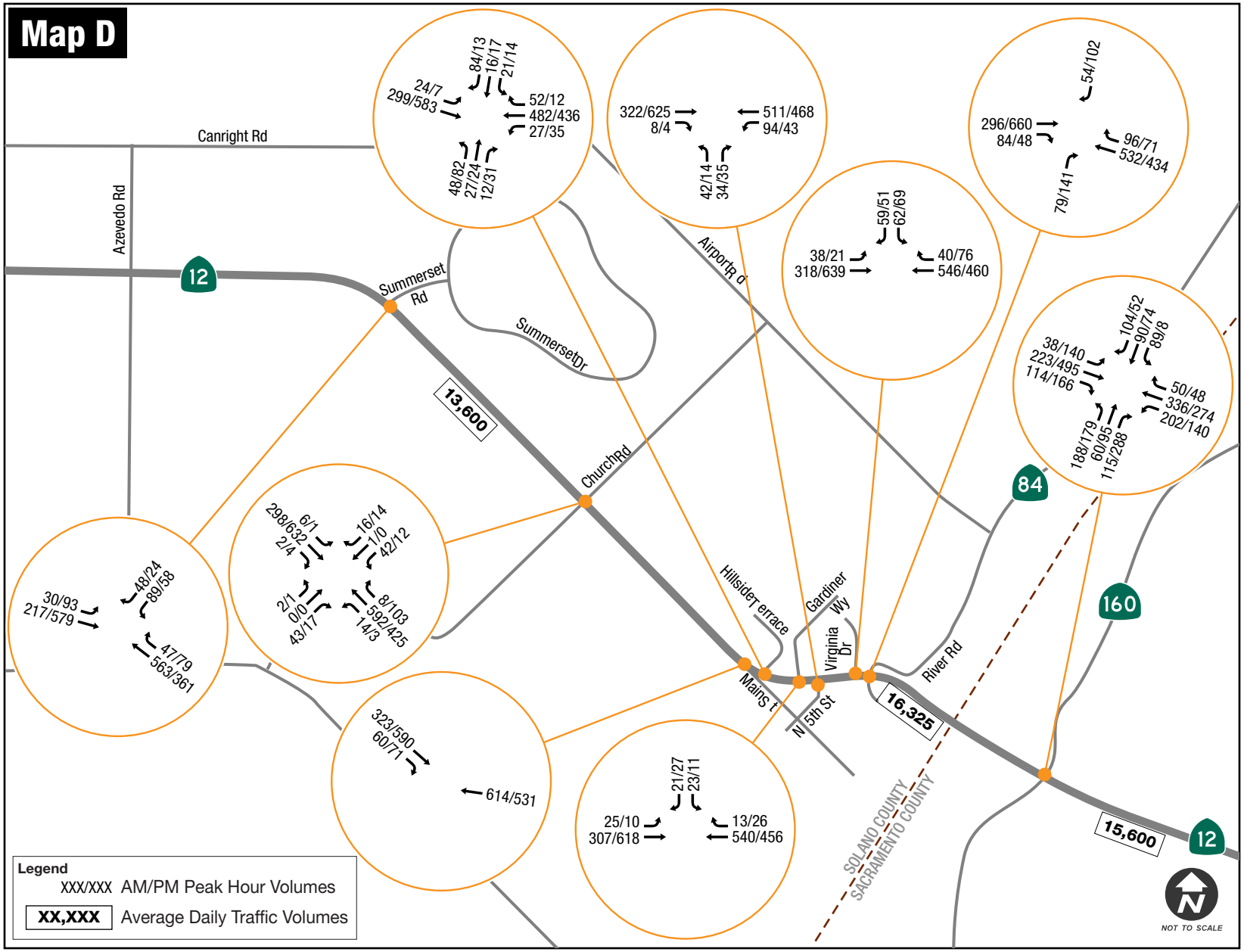
Turning Movement Detail Maps

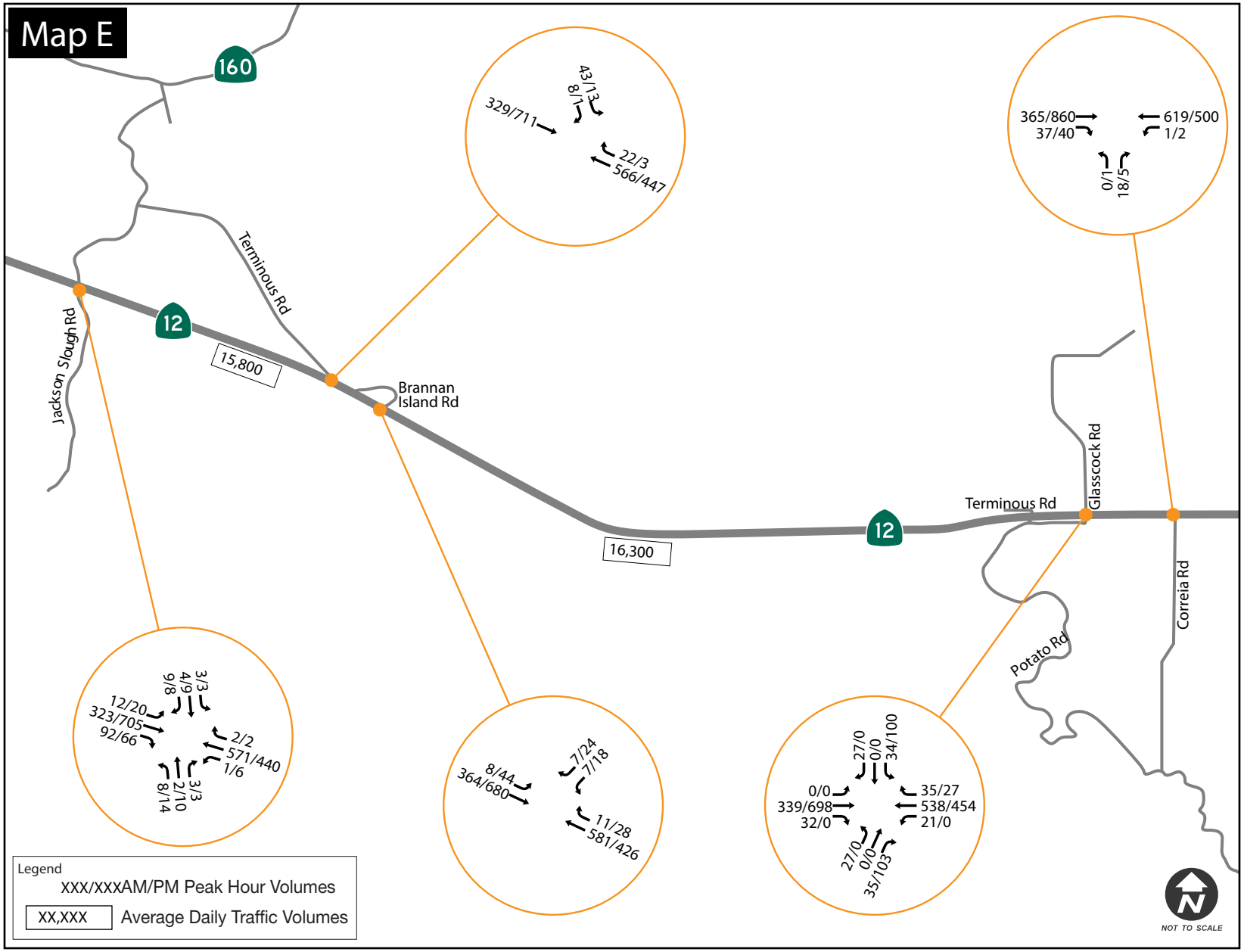
Note: See detail maps for ADT information

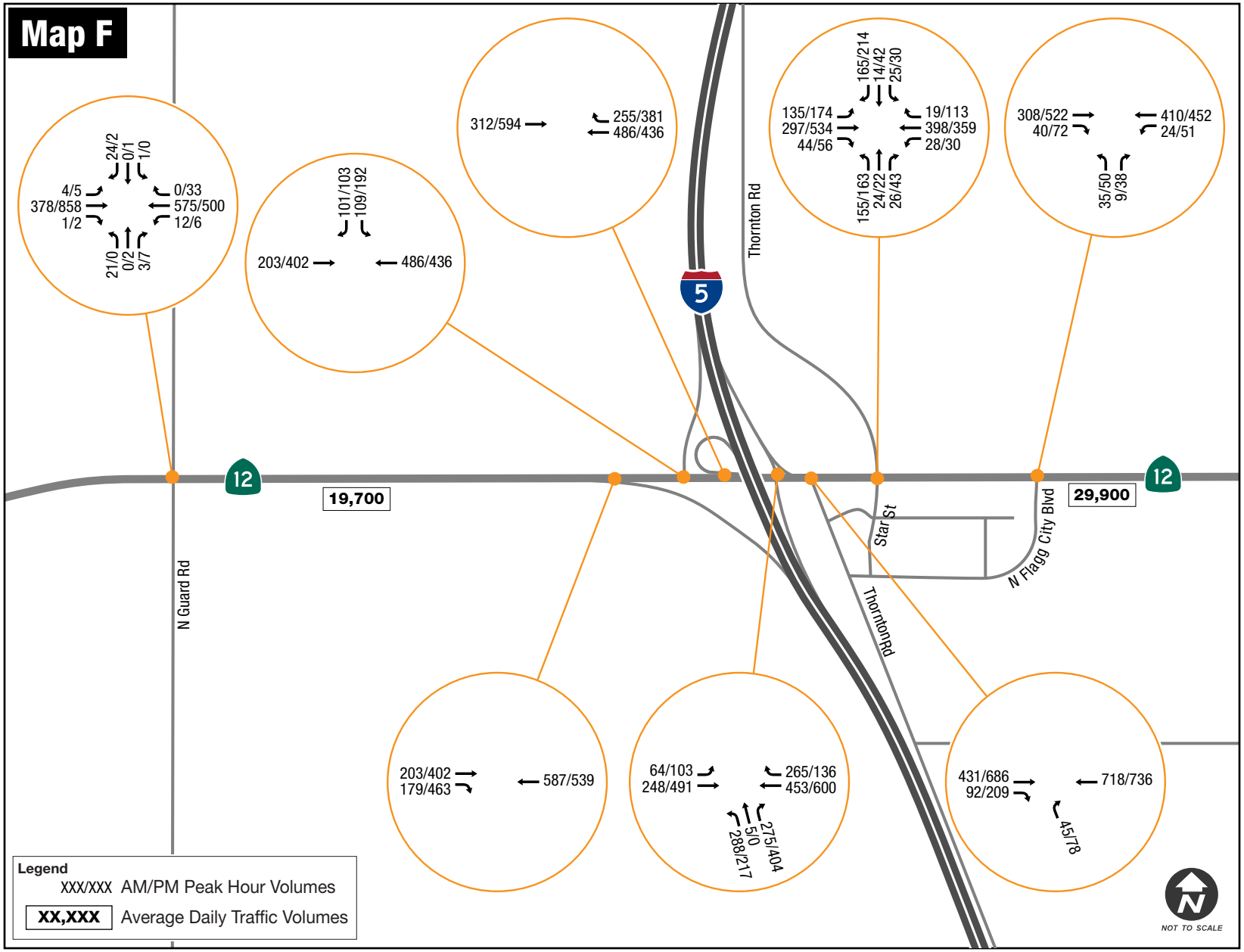

Map A
139/270
151/108
85/85
3/4
491/221
1/173
125/0
9/42
71/155
559/336
33/77
0/0
34/28
101/516
102/138
106/118
24/31
100/295
47/133
808/1826
34/16
137/232
1749/1115
22/13
9/13
17/44
6/43
W Texas St
Rockville Rd
80
Abernathy Rd
Auto Mall Pkwy
72/64
521/300
20/70
0/0
126/118
0/0
0/0
0/0
10/72
183/584
0/0
75/76
170/65
95/250
20/84
767/1621
55/13
87/134
1646/1058
131/54
12/58
37/201
27/104
Pennsylvania Ave
Beck Ave
43,000
12
Busch Dr
Chadbourne Rd
80/9
614/112
75/309
52/72
0/2
6/8
10/226
0/4
6/18
2/1
139/512
6/32
530/299
92/166
55/228
2/0
239/131
151/634
50/176
558/347
89/71
93/120
1/1
64/118
106/326
100/536
Cordelia Rd
Cordelia Rd
NOT TO SCALE
Legend
XXX/XXX AM/PM Peak Hour Volumes
XX,XXX Average Daily Traffic Volumes


Map B
563/288
38/94
19/33
121/579
665/1795
8/16
58/45
1683/1038
39/151
53/22
26/69
47/59
254/342
87/78
106/237
196/583
471/1154
64/150
72/117
1342/720
19/52
134/107
54/99
9/9
92/54
545/1340
14/10
1335/819
Tabor Ave
200/58
19/34
10/11
70/334
449/865
26/141
5/6
947/647
38/43
202/124
12/25
11/16
148/41
470/892
11/0
842/655
Texas St
Railroad Ave
Buena Vista Ave
Sunset Ave
Pintail Dr
Jackson St
Village Dr
Wigon Way
Snow Dr
Emperor Dr
Woodlark Dr
Walters Rd
Scandia Rd
46,100
12
Lotz Way
32,800
22,500
McCoy Creek Way
Civic Center Blvd
Marina Blvd
Grizzly Island Rd
Lawler Center Dr
Lawler Ranch Pkwy
Cordelia St
251/576
48/4
479/430
8/5
63/16
8/8
12
15,200
Kildeer Rd
Scally Rd
Potrero Hill Ln
130/153
41/95
3/69
1/7
0/0
46/52
6/15
57/97
3/43
19/40
3/7
26/27
0/0
83/99
98/128
731/1887
48/63
1682/1106
21/114
525/1275
61/125
15/98
1412/775
20/65
185/345
183/474
102/73
330/282
27/66
116/102
72/44
83/49
0/4
90/113
451/329
1/4
Legend
XXX/XXX AM/PM Peak Hour Volumes
XX,XXX Average Daily Traffic Volumes
N
NOT TO SCALE


Map C
150/584
109/0
0/0
0/0
0/0
50/0
0/0
0/0
482/282
Creed Rd
Denverton Rd
9,300
12
Nurse Slough Rd
Lambie Rd
Shiloh Rd
69/35
10/1
90/145
1/2
147/519
5/68
180/138
415/245
16/2
2/3
5/4
10/8
148/584
2/0
482/282
4/1
5/4
Flannery Rd
113
Maudes Ln
259/584
487/382
0/0
0/53
0/0
0/0
0/0
5/0
0/0
259/584
482/332
0/0
0/50
Little Honker Bay Rd
12
13,200
Olsen Rd
Birds Landing Rd
Legend
XXX/XXX AM/PM Peak Hour Volumes
XX,XXX Average Daily Traffic Volumes
N
NOT TO SCALE


Map D
Canright Rd
Azevedo Rd
12
Summerset Rd
SummersetDr
13,600
ChurchRd
AirportRd
Hillsider
Terrace
Gardiner Wy
Virginia Dr
Main St
N 5th St
River Rd
16,325
84
160
15,600
12
SOLANO COUNTY
SACRAMENTO COUNTY
24/7
299/583
84/13
16/17
21/14
52/12
482/436
27/35
48/82
27/24
12/31
322/625
8/4
511/468
94/43
42/14
34/35
59/51
62/69
38/21
318/639
40/76
546/460
54/102
296/660
84/48
96/71
532/434
79/141
38/140
223/495
114/166
104/52
90/74
89/8
50/48
336/274
202/140
188/179
60/95
115/288
6/1
298/632
2/4
16/14
1/0
42/12
2/1
0/0
43/17
8/103
592/425
14/3
30/93
217/579
48/24
89/58
47/79
563/361
323/590
60/71
614/531
21/27
23/11
25/10
307/618
13/26
540/456
Legend
XXX/XXX AM/PM Peak Hour Volumes
XX,XXX Average Daily Traffic Volumes
NOT TO SCALE


Map E
160
12
Terminous Rd
Jackson Slough Rd
15,800
Brannan
Island Rd
16,300
Terminous Rd
Glasscock Rd
Correia Rd
Potato Rd
329/711
43/13
8/1
22/3
566/447
365/860
37/40
619/500
1/2
0/1
18/5
3/3
4/9
9/8
12/20
323/705
92/66
2/2
571/440
1/6
3/3
2/10
8/14
8/44
364/680
7/24
7/18
11/28
581/426
27/0
0/0
34/100
0/0
339/698
32/0
35/27
538/454
21/0
27/0
0/0
35/103
Legend
XXX/XXXAM/PM Peak Hour Volumes
XX,XXX
Average Daily Traffic Volumes
NOT TO SCALE


Map F
24/2
0/1
1/0
4/5
378/858
1/2
0/33
575/500
12/6
21/0
0/2
3/7
101/103
109/192
203/402
486/436
312/594
255/381
486/436
165/214
14/42
25/30
135/174
297/534
44/56
19/113
398/359
28/30
155/163
24/22
26/43
308/522
40/72
410/452
24/51
35/50
9/38
Thornton Rd
5
12
19,700
N Guard Rd
29,900
Star St
N Flagg City Blvd
Thornton Rd
203/402
179/463
587/539
64/103
248/491
265/136
453/600
275/404
5/0
288/217
431/686
92/209
718/736
45/78
Legend
XXX/XXX AM/PM Peak Hour Volumes
XX,XXX Average Daily Traffic Volumes
NOT TO SCALE

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Appendix C: Seasonal Variations in Traffic Volumes

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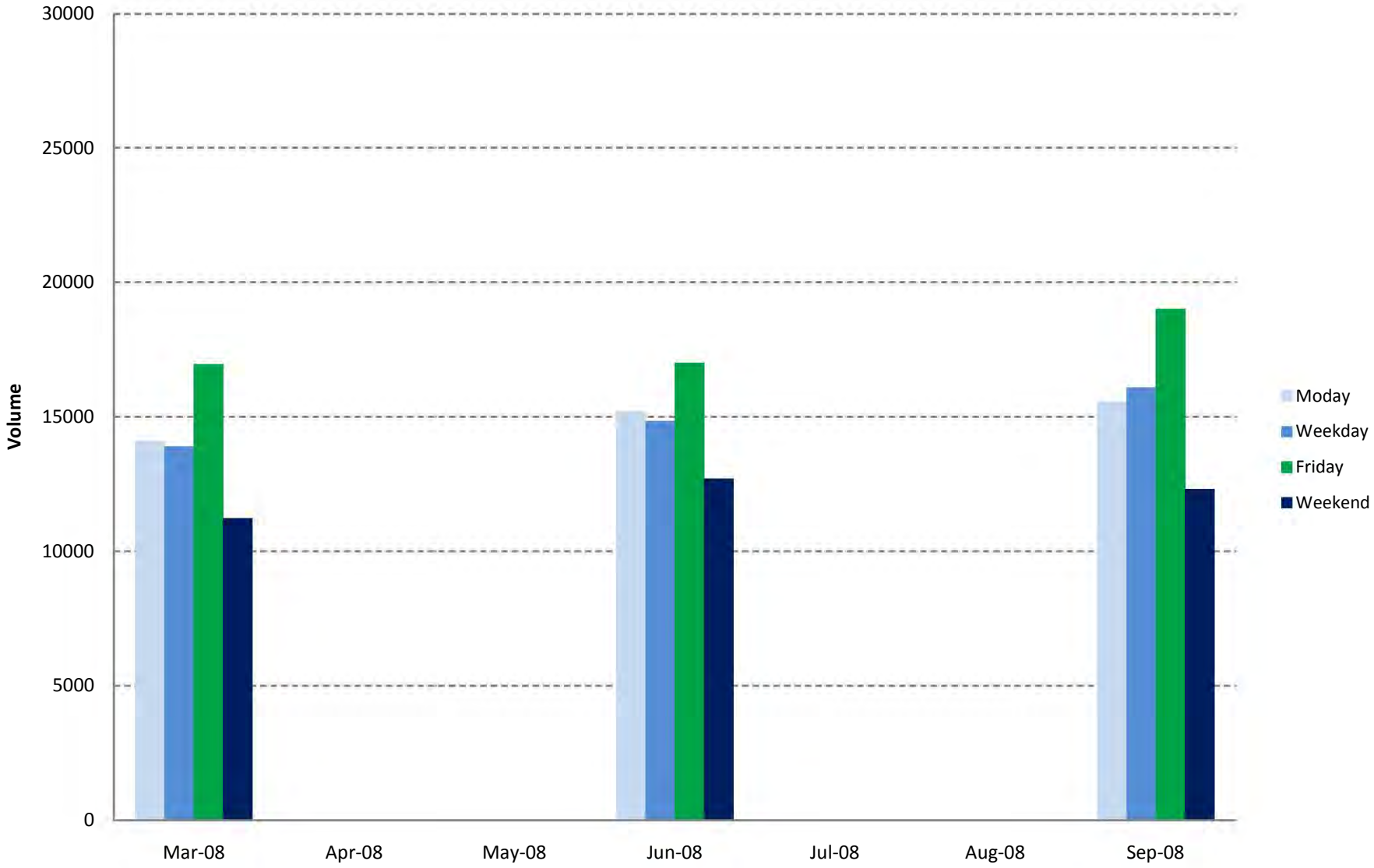
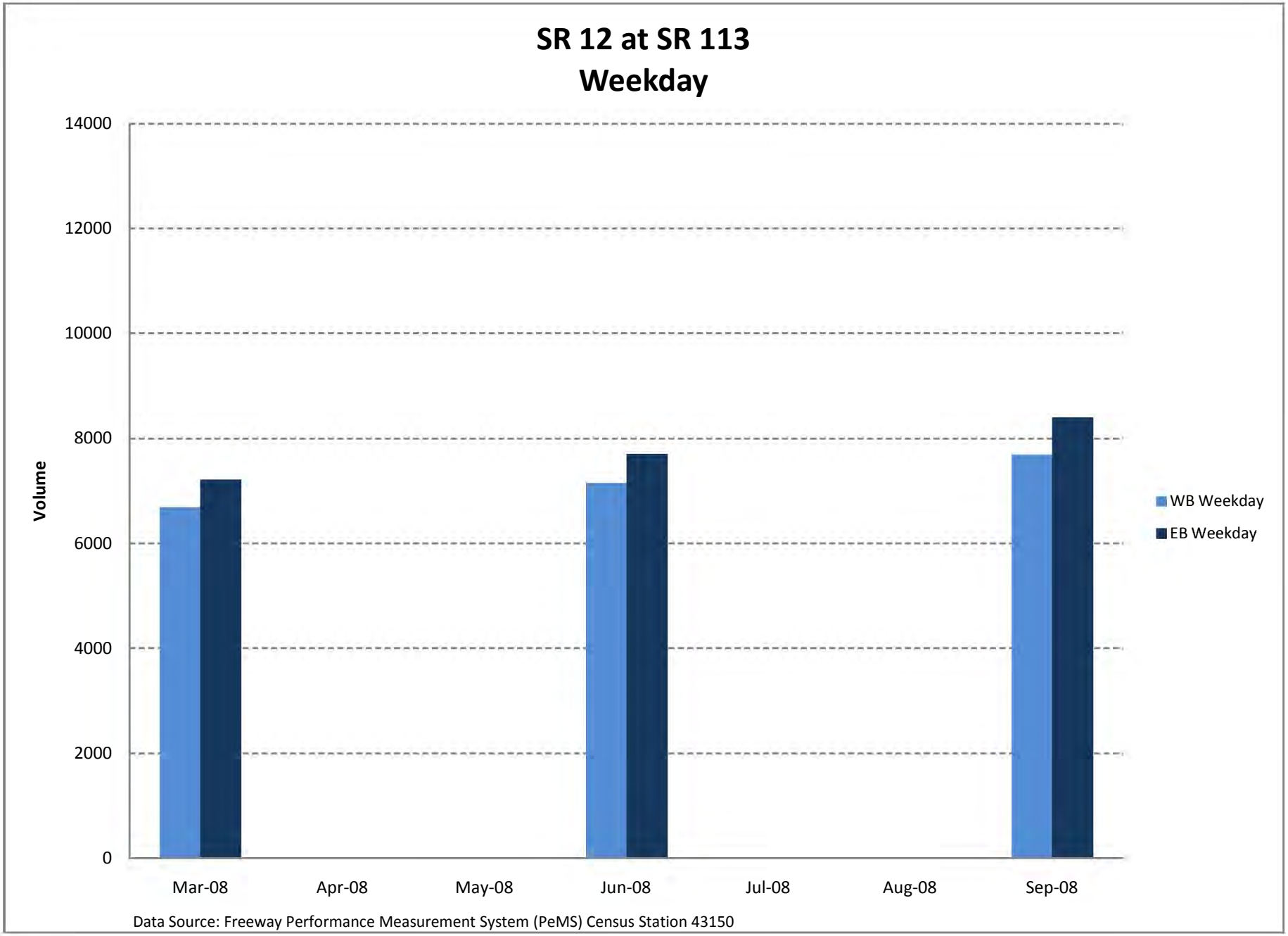
SR 12 at Walters Rd
Both Directions
Volume
30000
25000
20000
15000
10000
5000
0
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
Monday
Weekday
Friday
Weekend
Data Source: Freeway Performance Measurement System (PeMS) Census Station 43140


SR 12 at Walters Rd
Weekday
Volume
14000
12000
10000
8000
6000
4000
2000
0
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
EB Weekday
WB Weekday
Data Source: Freeway Performance Measurement System (PeMS) Census Station 43140

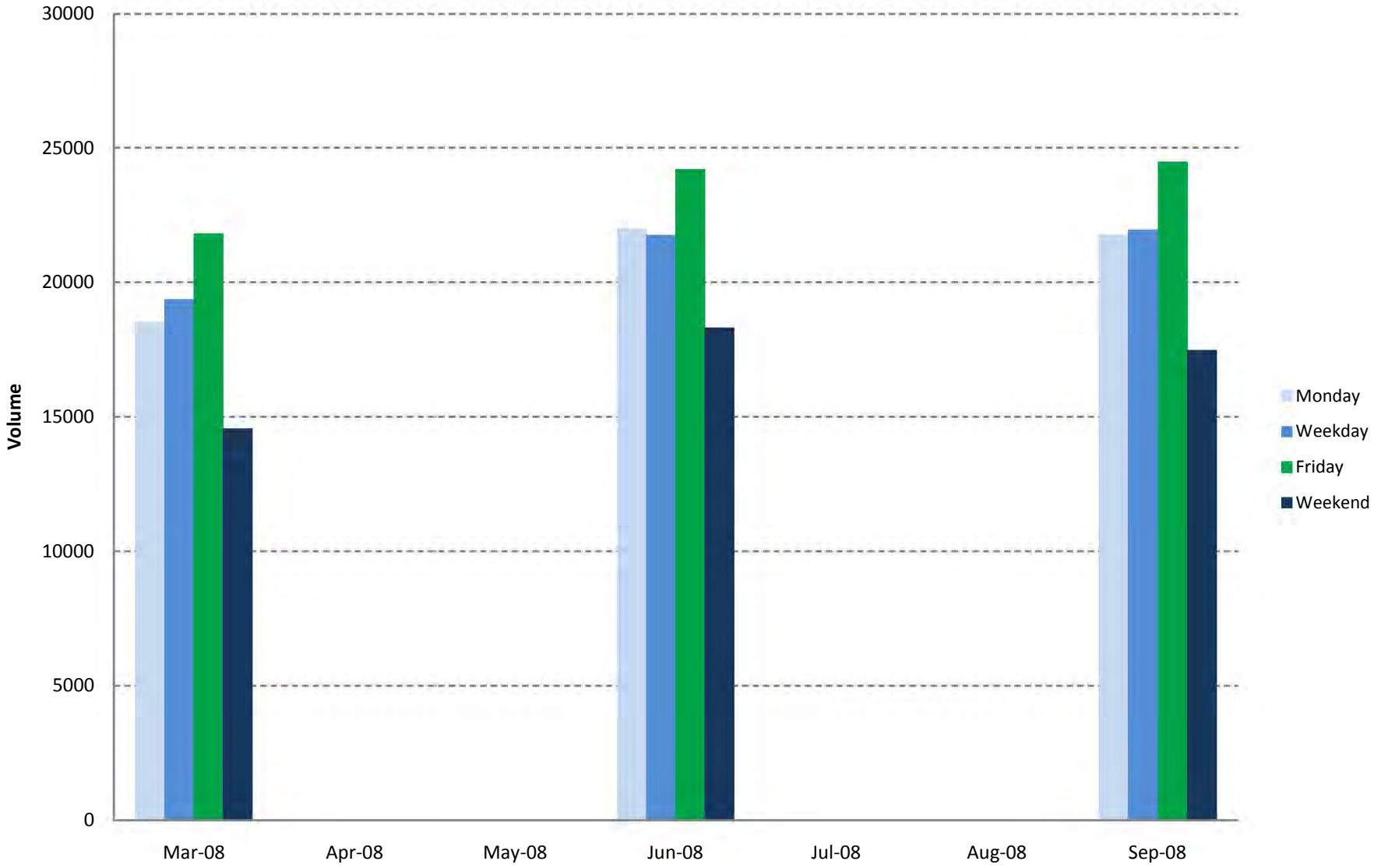
SR 12 at SR 113
Both Directions



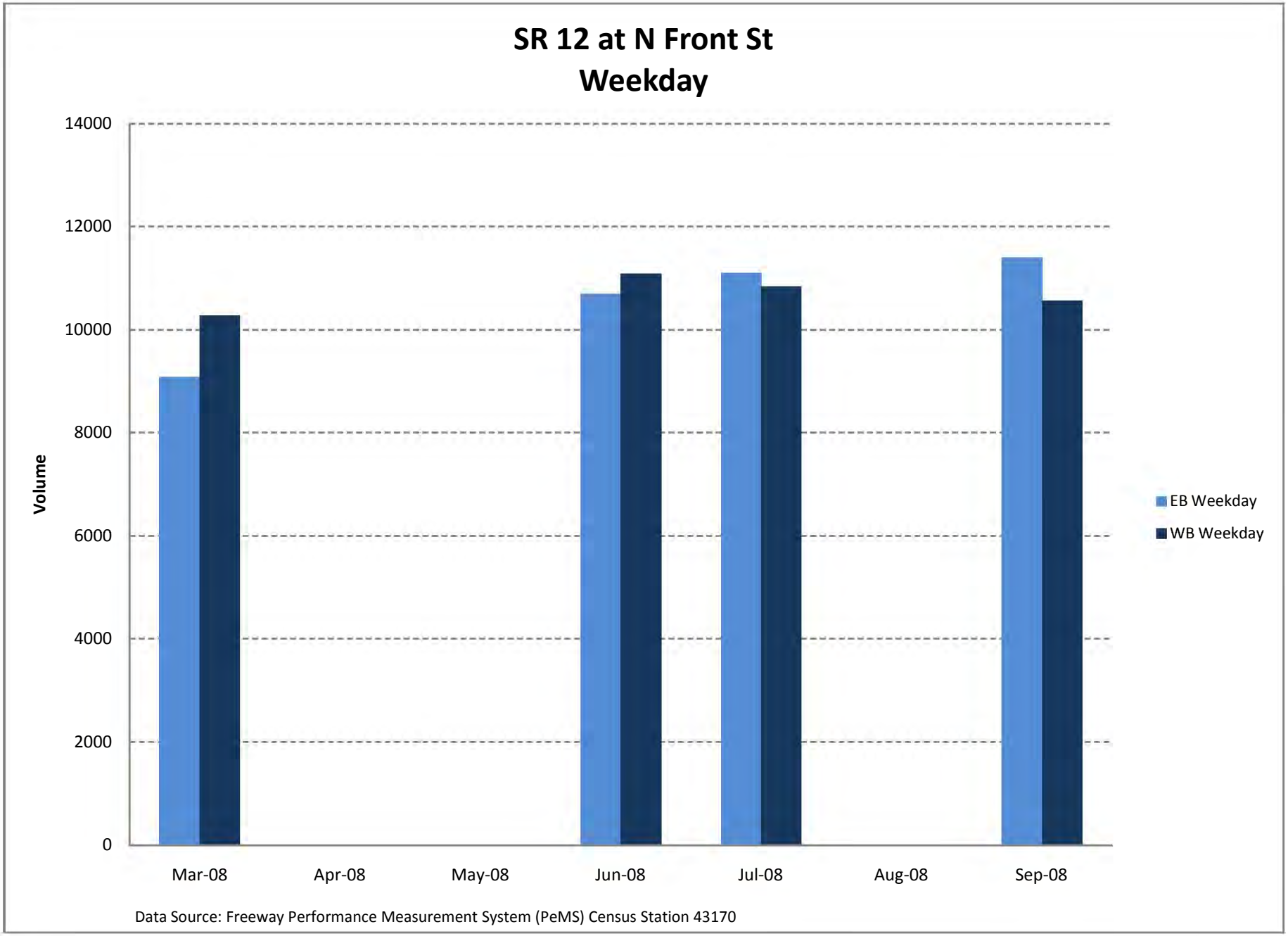
Data Source: Freeway Performance Measurement System (PeMS) Census Station 43150


SR 12 at SR 113
Weekday
14000
12000
10000
8000
6000
4000
2000
0
Volume
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
WB Weekday
EB Weekday
Data Source: Freeway Performance Measurement System (PeMS) Census Station 43150

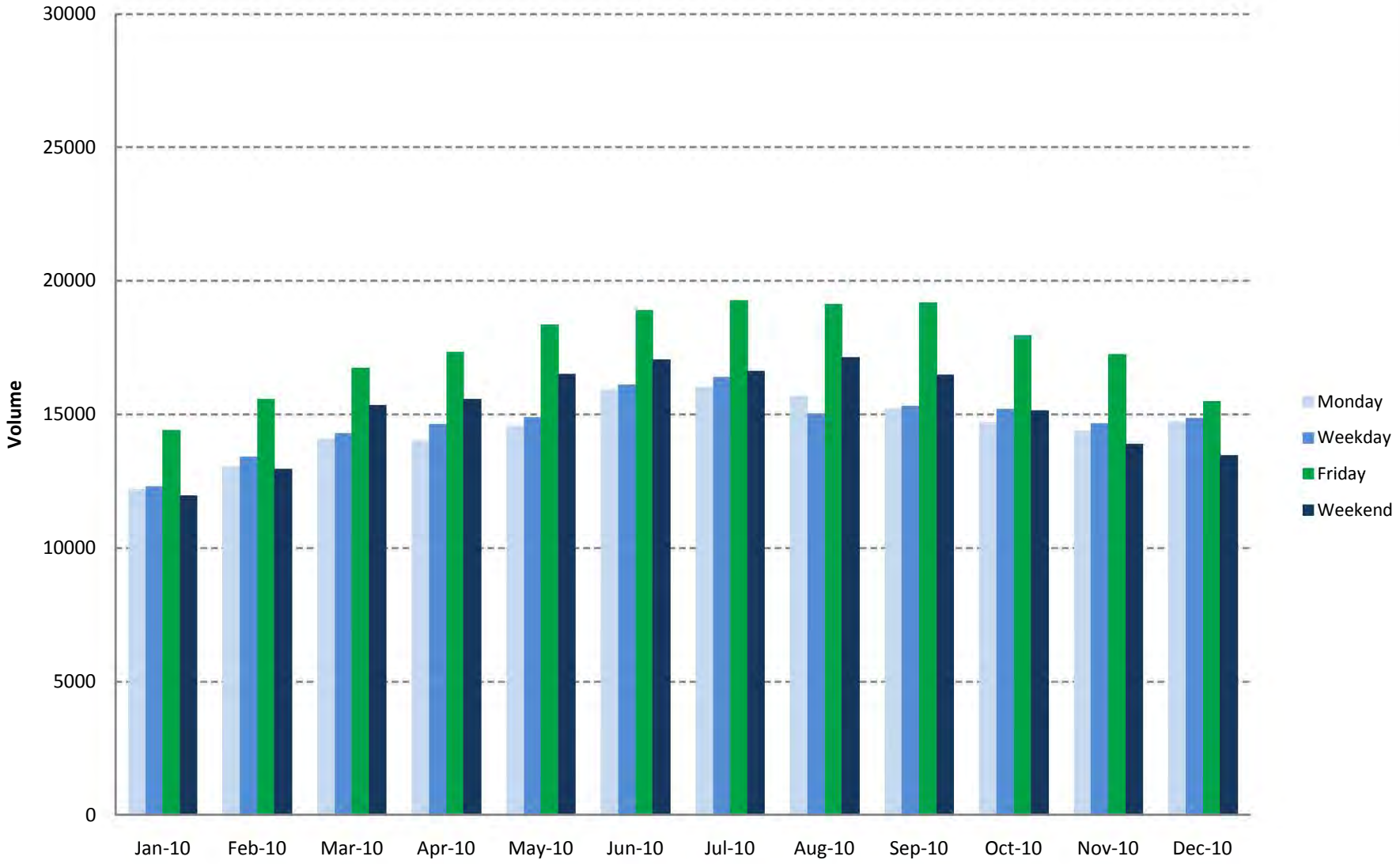
SR 12 at N Front St
Both Directions



Data Source: Freeway Performance Measurement System (PeMS) Census Station 43170

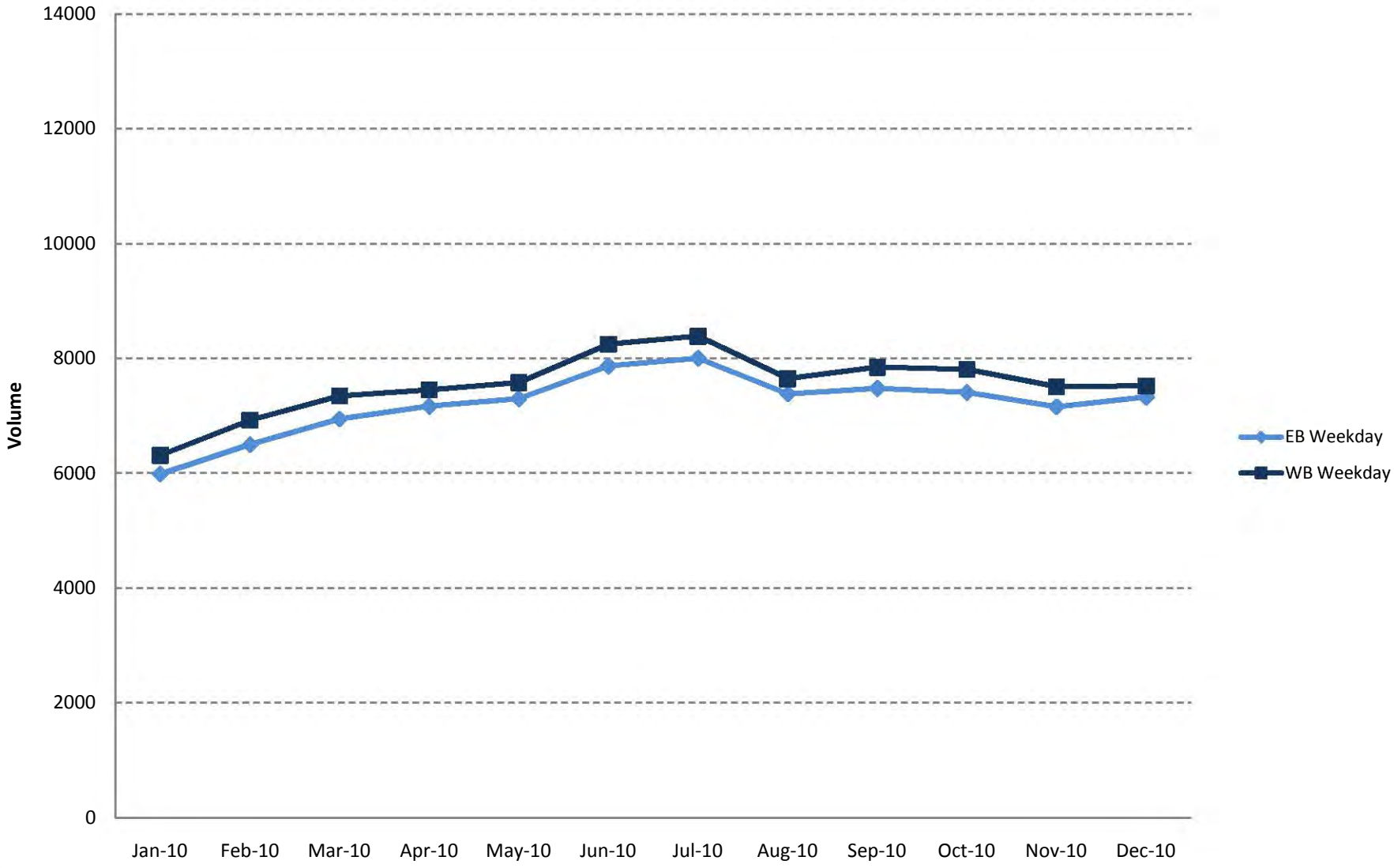

SR 12 at N Front St
Weekday
14000
12000
10000
8000
6000
4000
2000
0
Volume
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
EB Weekday
WB Weekday
Data Source: Freeway Performance Measurement System (PeMS) Census Station 43170

SR12 at Potato Slough Road
Both Directions



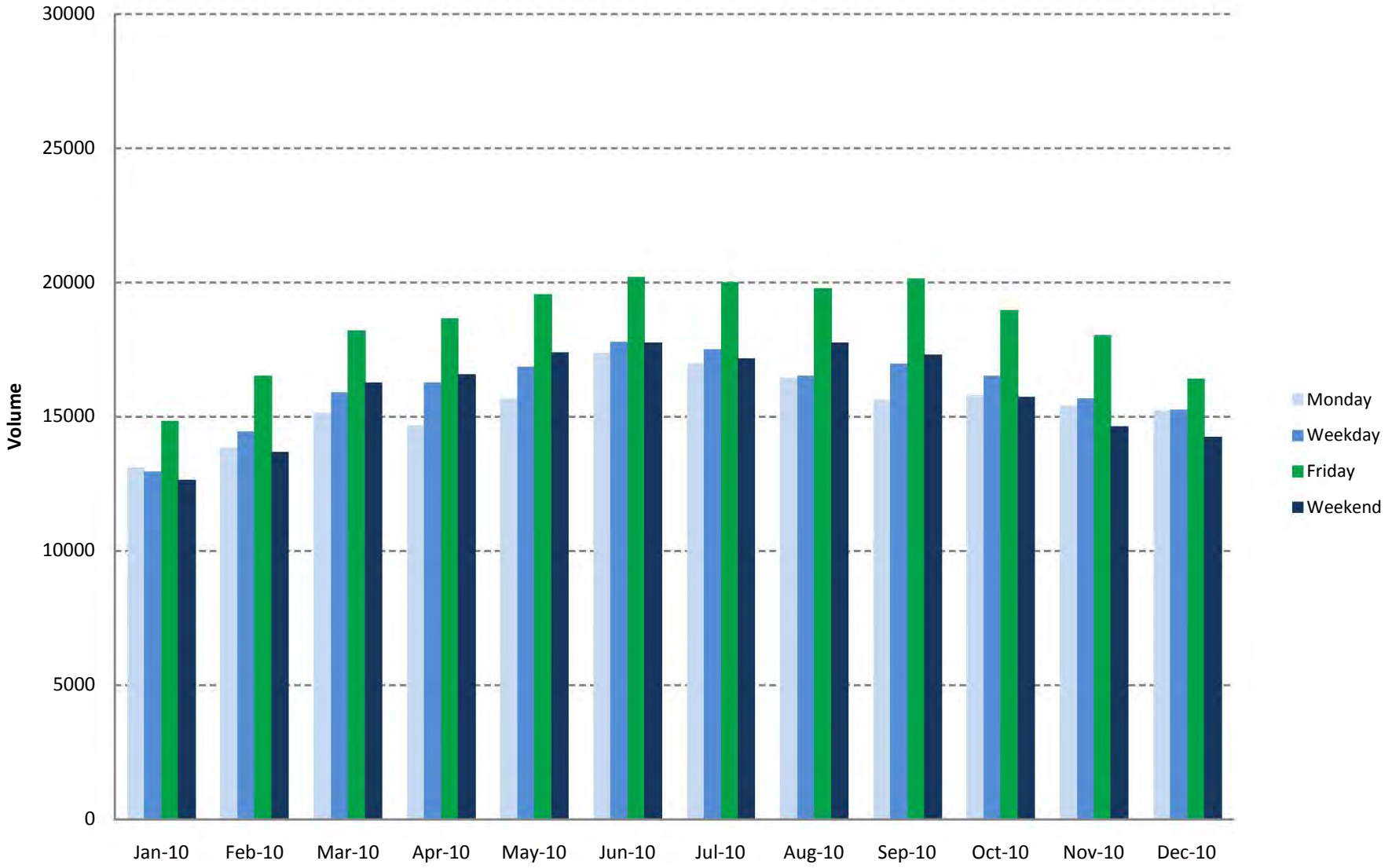
Data Source: Freeway Performance Measurement System (PeMS) VDS 1027910 and 1028010

SR12 at Potato Slough Road
Weekday



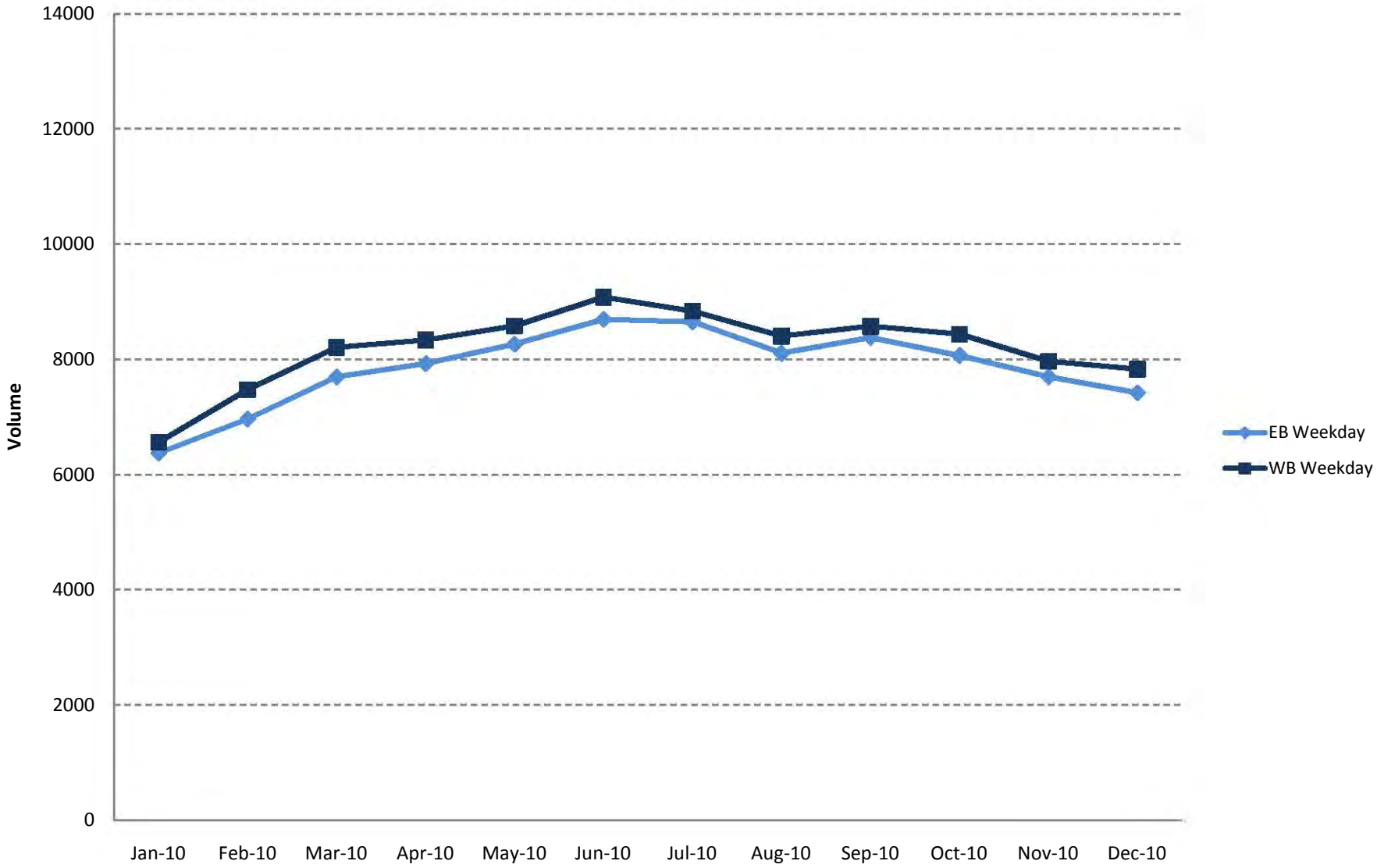
Data Source: Freeway Performance Measurement System (PeMS) VDS 1027910 and 1028010

SR 12 at Guard Road
Both Directions



Data Source: Freeway Performance Measurement System (PeMS) VDS 1028110 and 1028210

SR 12 at Guard Road
Weekday



Data Source: Freeway Performance Measurement System (PeMS) VDS 1028110 and 1028210